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Gas Journal

100th YEAR
AUG 11 1958
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AUGUST, 1958 | Only Magazine Edited Exclusively for the Gas Distribution Industry

eatable Combination: Hardcase Durability & Proven Tinned Steelcase Performance

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proven speed ratio and the many refine-
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50
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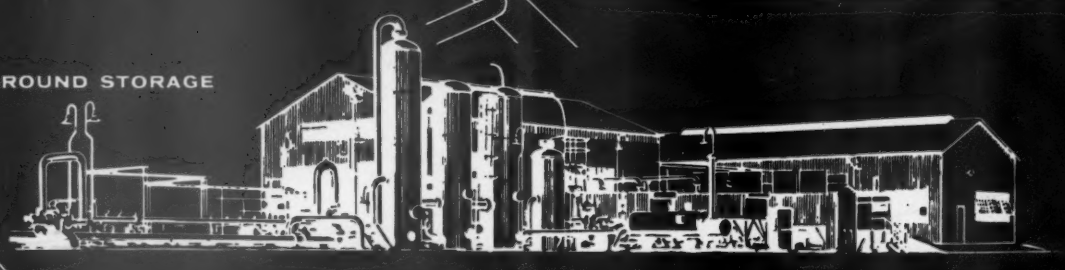
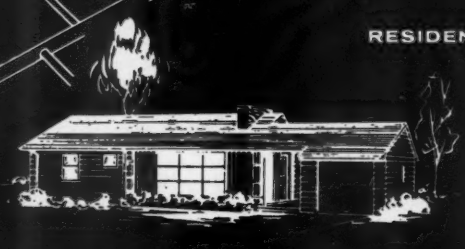
UNDERGROUND STORAGE

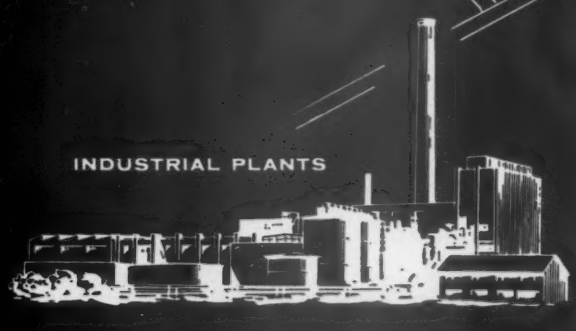


TOWN BORDER STATIONS

RESIDENTIAL



INDUSTRIAL PLANTS



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American Gas Journal®

ONLY MAGAZINE EDITED EXCLUSIVELY FOR THE GAS DISTRIBUTION INDUSTRY

August, 1958 **100th Year of Publication** Vol. 185, No. 8

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'1200'

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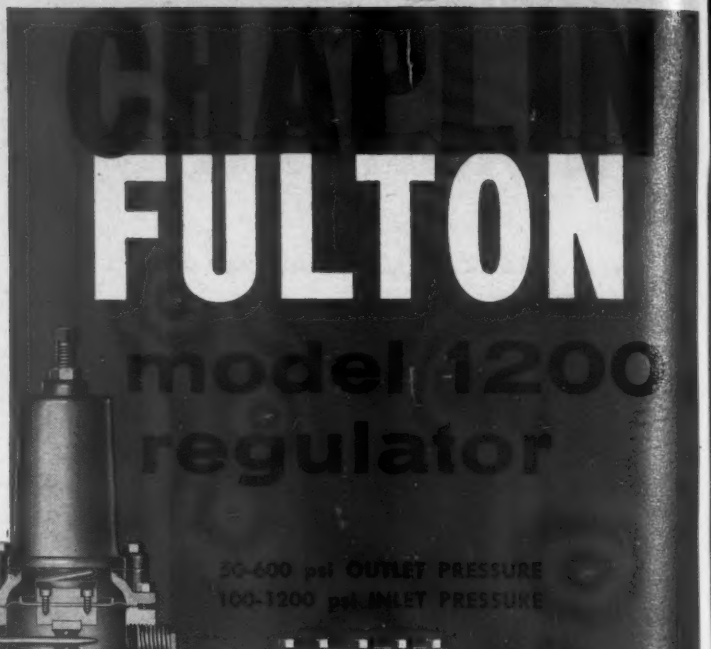
gives widest range control... no other like it!



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Working Pressure—1200 psi (Series 30-600 psi)

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Pittsburgh 25, Pennsylvania

American Gas Journal

Established July 1, 1859

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Printed in U.S.A.

Mcf

Automatic ignition on all burners becomes mandatory on all ranges produced after January 1, 1959. Members of the AGA board of directors voted recently against further postponement of the effective date of the approval requirement for domestic gas ranges. The new requirement means that all burners on a range that cannot be readily observed by the operator — such as ovens, broilers, and warming ovens — must be under the control of an automatic pilot that will shut off the flow of gas to the burners when there is no pilot flame to provide ignition. The action is a safeguard against human frailty by virtually eliminating the need for matches in the home as far as gas is concerned. It also improves the gas industry's competitive position through modernity and convenience of the range.

Development on a pilot study basis of a new underground storage field at Troy Grove, Illinois, has been initiated by Northern Illinois Gas Company. Injection of natural gas on a trial basis got underway in late July. The pilot operation, first step in developing the reservoir that could eventually store 8-billion cu ft, will be continued for about a year. If the study proves the project feasible, NIG plans to ask the Illinois Commerce Commission for approval to fully develop the field. Such action could make the dome-shaped storage formation available for use to customers during the 1960-61 heating season.

More than 50 significant new technical developments in gas utilization of the past two years have qualified for the "Parade of Gas Progress" utilization exhibit planned for the AGA annual convention in Atlantic City, October 12-15. All new technical developments in gas utilization that became commercially available since October 1956 are eligible for the exhibit.

Oil heat industry spokesmen see a tough fight ahead in the competitive struggle between natural gas and the oil industry to capture the home heating market. At an API Division of Marketing meeting in New Orleans, the oilmen were told that, in the past decade, natural gas used for heating increased in volume by 350 percent, while oil increased its share of the market from 26 to 44 percent, and coal heating declined radically from 63 percent of the total to 23 percent. Program speakers noted that last year gas beat oil by a ratio of 8 to 3 in the new growth. They called for greater effort to meet competition, including a "positive" selling approach instead of negative advertising, which discredits oil heat. If prices of gas continue to rise, the group was told, the price advantage of natural gas will be narrowed and, in some cases, cancelled out.

Retail sale of appliances has been discontinued by Long Island Lighting Company. The company is turning to a program of promoting local dealers. Free heating surveys will continue to be made by LILCO, and the company will continue its program of working with dealers and plumbers on cost estimates.

Florida may get its long-awaited natural gas service by the summer of 1959. Leon M. Reinach of St. Petersburg, president of the Houston Corporation, told a Jacksonville Chamber of Commerce group recently that plans called for construction of the supplying pipelines to begin in August. Reinach's firm will acquire and operate gas distribution properties throughout the state.

More gas for outstate Michigan is provided in plans of Trunkline Gas Company of Houston, which has asked the FPC to approve plans to increase its system capacity by 135,000,000 cu ft and to build a 204-mile extension to serve Consumers Power Company of Jackson, Michigan. The plan is the first step in an overall program to eventually supply 200,000,000 cu ft daily to Consumers, which now has a waiting list of over 160,000 for gas service.

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Oronite odorant products are warehoused at key points throughout the nation to assure you prompt delivery and service.

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Oronite maintains a technical field service staff of odorant specialists who can work closely with you in solving unique or individual problems. The field technical service staff is backed by a continuous research and development program to maintain Oronite's position as the foremost supplier of odorants to the gas industry.

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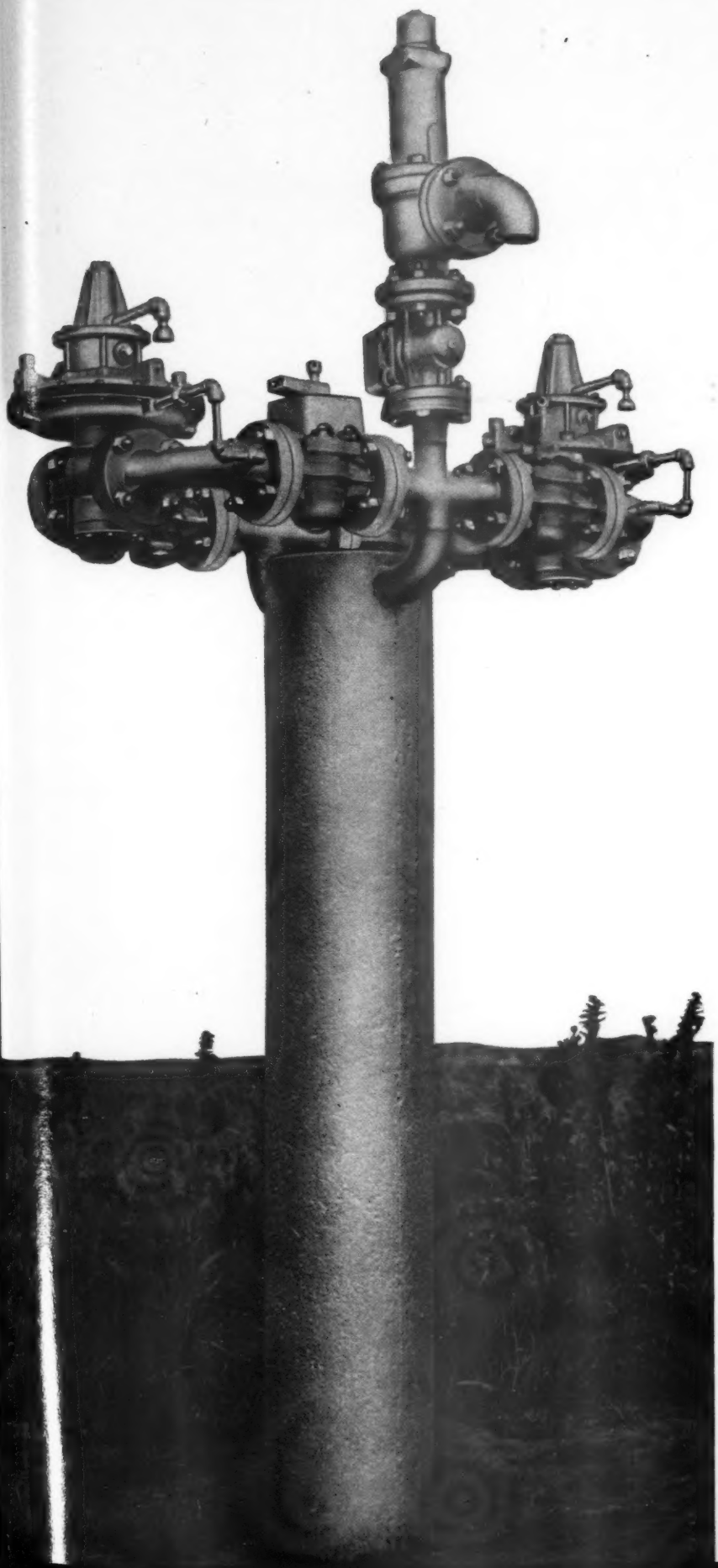
AND GET BETTER DISTRICT PRESSURE CONTROL



Why dig a costly vault when you have only a small distribution segment to serve from a high pressure line? Why not raise your pressure controls above ground and do the job quicker, better, more economically with Rockwell "1001" regulators and Rockwell-Nordstrom valves? There's no worry over tampering with this type installation. The Rockwell "1001" has a completely enclosed *power pilot* loading system. And Rockwell-Nordstrom valves can be fitted with locked hoods.

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IN the gas business you can't be half safe. The equipment you use, its installation and operation all must meet the highest security standards.

We at Rockwell carefully design and rigorously test our products with safety in mind.

One example: To resist impact, Rockwell meters are made with sturdy

SAFETY

A built-in bonus in Rockwell products

one-piece bowl type bodies. And they have but a single main joint to seal against leakage.

Another: Completely encased Rockwell regulators discourage tampering —protect against shock. Where the flexibility of outside weights is desired or where internal pressure relief is desirable, regulators with auxiliary safety controls can be recommended and furnished.

All Rockwell meters and regulators are tested before shipment at least double their rated working pressure. And all casting designs undergo a series of rupture tests at elevated pressures before release to production.

Because of such precautions, buyers of Rockwell equipment enjoy the peace of mind that comes only through use of the finest, safest equipment. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

FOUR WAYS IN WHICH ROCKWELL EXCELS

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Coming Events

IN THE GAS DISTRIBUTION INDUSTRY

August

25-27 Appalachian Gas Measurement Short Course, University of West Virginia, Morgantown, West Virginia.

September

3- 5 PCGA annual convention, Benson and Multnomah Hotels, Portland, Oregon.
5 New Jersey Gas Association, annual meeting, Berkeley Carteret Hotel, Asbury Park, New Jersey.
11 NEGA safety conference, Sheraton Plaza, Boston, Massachusetts.
12 NEGA commercial industrial heating division, Wachusett Country Club, West Boylston, Massachusetts.
16-17 AGA 10th annual accident prevention conference, Sheraton-Seelbach Hotel, Louisville, Kentucky.
17-19 Southeastern Gas Association, annual meeting, Sir Walter Hotel, Raleigh, North Carolina.
19 Oklahoma Utilities Association gas division conference, Biltmore Hotel, Oklahoma City, Oklahoma.
25 AGA Great Lakes PR workshop, Cleveland, Ohio.

October

9-10 National Noise Abatement Symposium, Hotel Sherman, Chicago, Illinois.
10 NEGA, heating group of C-H-I division, Publick House, Sturbridge, Massachusetts.
13-15 AGA, annual convention, Atlantic City, New Jersey.
15-17 Wisconsin Utilities Association electric and gas sales operating convention, Hotel Schroeder, Milwaukee, Wisconsin.
17 NEGA, industrial group of C-H-I division, Sheraton-Biltmore, Providence, Rhode Island.
20-24 National Safety Council, Chicago, Illinois.
20-24 NACE, annual conference and exhibition, south central region, Roosevelt Hotel, New Orleans.
21-22 Purchasing Workshop Conference, Illinois Institute of Technology, Chicago, Illinois.
22-24 Air Conditioning & Refrigeration Wholesalers, annual meeting, Sheraton-Palace Hotel, San Francisco, California.
23 AGA Mid-West PR workshop, Hotel Sheraton-Martin, Sioux City, Iowa.
24 Oklahoma Utilities Association accounting conference, Burlingame Hotel, Bartlesville, Oklahoma.
29-30 Computer Applications Symposium, sponsored by Armour Research Foundation, Morrison Hotel, Chicago, Illinois.
30 NEGA operating division, Sheraton Kimball Hotel, Springfield, Massachusetts.
31 NEGA accounting division, Statler Hilton Hotel, Hartford, Connecticut.

November

17-19 National Fire Protection Association fall conference, Pittsburgh, Pennsylvania.
18-20 American Standards Association, Hotel Roosevelt, New York, New York.

Joe Roughneck's solid source of supply...

© API CASING | API TUBING | API LINE PIPE

Wheel of plentyl Welding pipe by electric resistance weld process. Lone Star API pipe is fully normalized.

Joe Roughneck, of course, is symbolic of the men who have made the fabulous oil and gas industry tick .. and Lone Star Steel's huge completely integrated plant is right in the middle of Joe's workshop. Lone Star pipe is quality-controlled from mining of ore to finished pipe. In addition to operating day and night to supply Joe's pipe needs .. Lone Star has recently completed new and even larger facilities.

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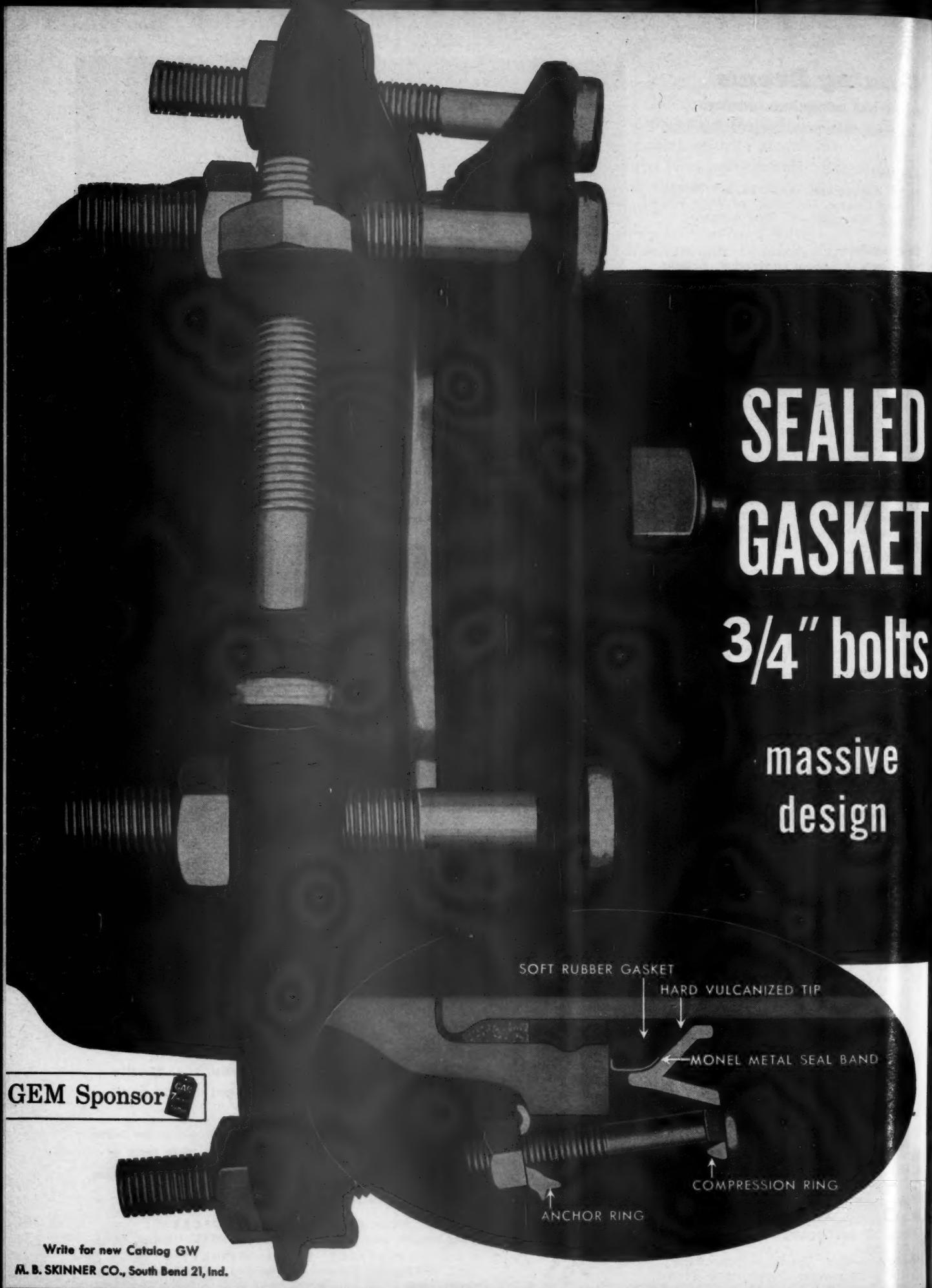

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massive design

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Pioneer "Master Meter" Installation. American 500-B Ironcase Meters, one with Volume and Pressure Gage, record volume and pressure of gas delivered to a group of wells on Pioneer's line.

where the crops grow greener...

THANKS TO NATURAL GAS

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Irrigation has become a dominant factor in the agricultural economy of the area served, resulting in greater crop yields and profits. And, Pioneer's peak load is no longer in winter, but in summer.

Pioneer delivers gas from its irrigation feeder lines to groups of ten to twelve wells through a "Master Meter" installation. Lines from the "Master Meter" to the wells are owned by the farmers but delivery to each well is measured at the internal combustion engine.

American Ironcase Meters are used at "Master" and wellhead measuring points.

Wherever ability to withstand the elements and to produce sustained accuracy at low maintenance cost is required, you, too, can benefit from American engineering and American equipment for measurement and control.

Well Set Readings at each pumping operation are made by American 35B Ironcase Meters. Occasional differences between "Master" meter and "well set," readings represent line losses which are pro-rated among farm customers by Pioneer Natural.

Volume and Pressure Gage, (0 to 100 lb.) on 500-B Ironcase Meter and two Reliance Type HPR-10 Regulators at each Pioneer "Master Meter" installation, operate at 40 to 50 pounds pressure.

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THE MOST

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AVAILABLE WITH

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MOUNTING

TILT-TOP

The hinged top swings back for easy access to interior.

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Mixture control offers maximum candlepower ... mantle lasts for years, even with constant burning.

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Let the "ARKLA team" assist you in initiating a successful Gaslite Sales Program.
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Men At Work

IN THE GAS DISTRIBUTION INDUSTRY

B. E. Gallagher

G. R. Hadden

● At Consolidated Edison, **Bernard E. Gallagher** and **Gerald R. Hadden** have been elected vice presidents. **Arthur N. Anderson** has been elected assistant vice president; **Gordon R. Milne** and **Charles W. Franklin** have been named chief mechanical engineer and chief electrical engineer respectively.

● York County Gas Company has announced the following changes in their organization: **T. W. McDonald,** retiring chairman of the board, has been named honorary chairman, and **John E. Geesey** has been named president and general manager. Other appointments include **M. P. Stermer** to vice president-secretary and treasurer; **Paul W. Lauer** to assistant secretary and assistant treasurer; **William J. Hladick** to superintendent of transmission and distribution, a newly created position; **William E. Smeign, Jr.,** to supervisor of maps and records; **George H. Leckrone,** to purchasing agent for the transmission department; and **William J. Knokey,** to transmission department dispatcher.

● **Robert K. Eskew,** pioneer in the development of absorption systems for year-round air conditioning, has been named director of engineering, research, and development for Arkla Air Conditioning Corporation. He was formerly president of York Houston Sales, Inc., air conditioning distributor of York products in Houston.

● **John M. Rutherford** and **John A. Bieber** have been elected vice presidents of Ohio Fuel Gas Company. Rutherford, former treasurer, will be in charge of finance and accounting; Bieber will be in charge of wholesale sales. **William J. Curnow** has been elected treasurer and **Luther S. Williams** has been elected assistant treasurer of the company.

● **Burdette A. Johnson** has been elected treasurer of the New England Gas and Electric Association. Action of the association board followed resignation of **H. Coleman Moore Jr.,** in anticipation of his retirement from active service on October 1, 1958. Johnson has also been elected treasurer of the Cambridge Gas, Cambridge Electric, Cambridge Steam, New Bedford Gas and Edison Light, Plymouth County Electric, Cape & Vineyard Electric, Worcester Gas Light, and NEGEA Service companies, all subsidiaries of the New England Gas and Electric Association. Simultaneously, **John MacLachlan,** former secretary and assistant treasurer of the association, has become comptroller replacing Johnson in his old position.

● The United Gas Improvement Company has announced the election of **John H. Mackenzie** as secretary and treasurer upon the retirement of **Johns Hopkins.** Mackenzie was formerly assistant secretary and assistant treasurer.

● **H. B. Keenleyside** has been elected a director of Union Gas Company of Canada, Limited. He is president and managing director of Photo Engravers and Electrotypers Limited, and is also a director of The Robert Simpson Company, Limited.

● **John G. Williamson,** general manager of The Kansas Power and Light Company's natural gas department, has been elected to KPL's nine-man board of directors. He succeeds the late C. E. Brock, who was a vice president and director until his death in mid-1957. Williamson was superintendent of the natural gas department and assistant to Brock.

● **William B. Waterman,** general counsel, Iowa-Illinois Gas and Electric Company, has been elected vice president and general counsel of the company.

W. B. Waterman

J. D. Morris

● **J. D. Morris** has been appointed sales manager of the new utility tractor and equipment sales department of Allis-Chalmers Manufacturing Company.

● **Robert S. Elias** has been named chief system gas dispatcher for Columbia Gas System and will headquarter at Charleston, West Virginia. He succeeds **Samuel A. Chadwell,** who retired recently after nearly 46 years with Columbia and its affiliated companies.

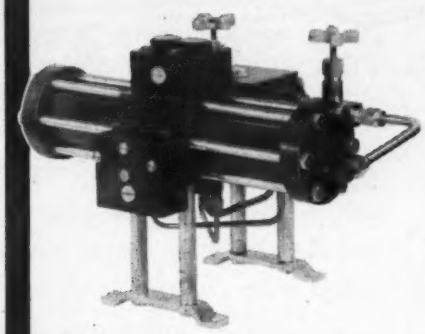
R. S. Elias

D. J. Miller

● **F. Tom Parks,** vice president and member of the board of directors of Public Service Company of Colorado, has retired. Succeeding him, is **D. J. Miller,** who has been elected vice president gas operations. **O. P. Reed** has been elected vice president, employee relations. In recent action, the board of directors also elected **W. D. Virtue, M. M. Koch,** and **R. T. Person,** executive vice presidents. **W. D. Virtue** was also re-elected treasurer.

KIMRAY INC.

GLYCOL PUMPS



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- Completely sealed system prevents loss of glycol
- No springs or toggles — only two moving assemblies
- New style "cushioned" check valves

*The power source is WET GLYCOL from the absorber plus a small amount of gas.

MODEL NO.	CAPACITY	WORKING PRESSURE
1715 PV	17 gph	1500 p.s.i.
4015 PV	40 gph	1500 p.s.i.
9015 PV	90 gph	1500 p.s.i.
21015 PV	210 gph	1500 p.s.i.

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Oil and Gas Equipment and Controls
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OKLAHOMA CITY 18, OKLAHOMA

The new Superior ALUMINUM CASE METERS

. . . the slow-motion meters you can rely on longer

This slow-motion, long-lived meter operates at only 7 revolutions per cubic foot to reduce wear and stay accurate longer. And its simple, horizontal seam construction gives fewer chances for leaks . . . makes maintenance quick and simple. Whether it's adjusting the tangent through the handy access in the top . . . removing the top to grind the valve seat . . . or lifting out the valve table with the entire inner movement to replace the diaphragm, simply loosening a few screws makes everything accessible.

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This modern meter exploits all the time-tested advances in meter technology *plus* the latest manufacturing techniques of Superior's new plant.

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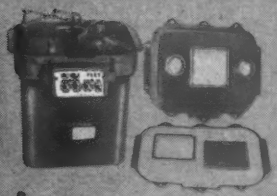
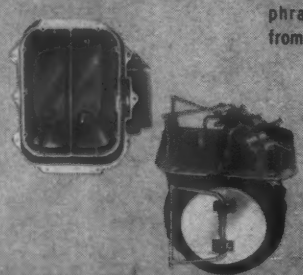
neptune

1. Simple, horizontal seam . . . eliminates leakage . . . easier maintenance
2. Easily accessible table . . . just remove the screws holding top



3. Meter top removable without taking off index box
4. Valve seat readily accessible for grinding when top is removed
5. Slow movement; only 7 revolutions per cubic foot
6. Seam gasket stays resilient . . . cork and Buna-N composition
7. Valve table lifts out with entire mechanism



8. Heavy-duty, sintered bronze bearings oil-impregnated for life
9. Flag arrangement gives arm smoother operation and longer life
10. Accurately controlled diaphragm . . . no inaccuracies from deflection
11. Cupped handling lids permit easy and safe carrying
12. Handy access for tangent adjustment and calibration
13. Broad base for solid stacking . . . designed for conveyorized handling
14. Index removable without removing meter

In 250 cfh and 340 cfh sizes to meet most domestic requirements.

● **R. Dewitt Pike** has been elected a vice president of Rochester Gas and Electric Corporation. He was formerly director of employee relations.

R. D. Pike

Ohmer Ullery

● **Ohmer Ullery,** former assistant treasurer of the Ohio Fuel Gas Company, has been elected assistant treasurer of Columbia Gas System Service Corporation. He will coordinate and direct all accounting and treasury activities of the service company.

● **Warren J. Collins** has been appointed general counsel for Lone Star Gas Company and its wholly-owned subsidiary, the Lone Star Producing Company. He succeeds **Marshall Newcomb** who, because of continued ill health, has elected to retire under provisions of Lone Star's retirement plan.

● **Malcolm C. Macauley** has been appointed assistant manager of North Shore Gas Company with headquarters at Beverly. He was formerly vice president and director of Norwood Gas Company. **John H. Tyler** has been named vice president and manager of Norwood Gas Company. He was formerly assistant manager of North Shore Gas Company.

● Indiana Gas & Water Company, Inc., has re-elected the following officers: **Louis B. Schiesz,** chairman of the board of directors; **Herman G. Horstman,** president; **Fred W. Dopke,** first vice president; **Louis A. Kirch,** vice president; **Ernest B. Smith,** secretary; **John F. Kavanagh,** treasurer; **Hulda Johanningsmeier** assistant secretary, and **Howard E. Holmes,** assistant treasurer.

● **W. F. Ivers** has retired from his position as Beaumont division manager for United Gas Corporation under the company's plan for retirement at the age 65. He has completed 28 years of continuous service with United Gas. **Ross Walker,** former assistant division manager in Beaumont, succeeds him as division manager.

W. F. Ivers

G. W. Horsley

● **George W. Horsley,** senior vice president and director of The East Ohio Gas Company, has retired after 43 years service. Horsley has been a company director for 25 years.

● **Peter J. McTague** has been promoted to assistant vice president of Citizens Utilities Company. He was formerly assistant to the vice president in charge of operations and engineering.

● **James H. Erwin** has been elected a vice president of Central Illinois Electric and Gas Company. He was formerly superintendent of the gas division.

● **Robert W. Ramsdell** has been elected a director of Consolidated Natural Gas Company succeeding **William G. Rogers** who is retiring pursuant to provisions of the company's retirement policy. Ramsdell is president of two of Consolidated's subsidiaries, The East Ohio Gas Company of Cleveland, and Lake Shore Pipe Line Company of Ashtabula, Ohio.

● **Ed Parkes,** executive vice president of United Gas Corporation since 1955, has been appointed president of the corporation. He is also president of Union Producing Company and United Gas Pipeline Company. He succeeds **N. C. McGowen,** who remains as chairman of the board, a position he has held in addition to the presidency for several years.

● **Harold Burrow,** veteran senior vice president of Tennessee Gas Transmission Company, has been designated first vice president and assistant to the president. To meet increasing administrative needs brought about by the company's expansion, the board of directors also designated three officers as new senior vice presidents and elected four other executives as new vice presidents. New senior vice presidents are: **C. C. Johnson,** former vice presid...t and treasurer; **Joe J. King,** former vice president (engineer development) and **W. W. Witmer,** former vice president (gas supply). Newly-elected vice presidents were: **W. C. Braden, Jr.** former director of certificates; **L. W. A. Campbell,** former chief engineer; **O. H. Simonds, Jr.,** former director of sales, and **Stanley Ward,** former director of taxes.

E. F. Barrett

Edward F. Barrett, director of Long Island Lighting Company, chairman of the company's pension committee, and trustee and vice president of the East River Savings Bank, died June 30 in Rockville Centre, Long Island. He was 70.

F. H. Adams

Frank H. Adams, president of Surface Combustion Corporation, died recently in Toledo. He was 72.

C. L. Draper

Claude L. Draper, former FPC member, died April 30 in Washington, D. C., after an illness of several weeks. He retired June 22, 1956, from the Federal Power Commission after serving as a member of the commission since it was reorganized as an independent agency in 1930.

John Dern

John Dern, director and general counsel of American Natural Gas Company, and director of all of its subsidiary companies, died May 21. Partner in the law firm of Sidley, Austin, Burgess and Smith of Chicago, Dern had been associated with the American Natural Gas system for many years. He was president of both the predecessor United Light & Railways Company and of the latter's subsidiary, Continental Gas & Electric Corporation, during the liquidation of both companies.

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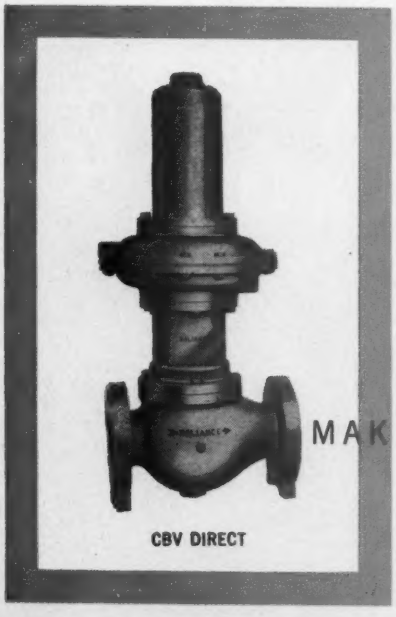
TYPE "CBV" COMBINATION BALANCED VALVES for safe, efficient gas regulation



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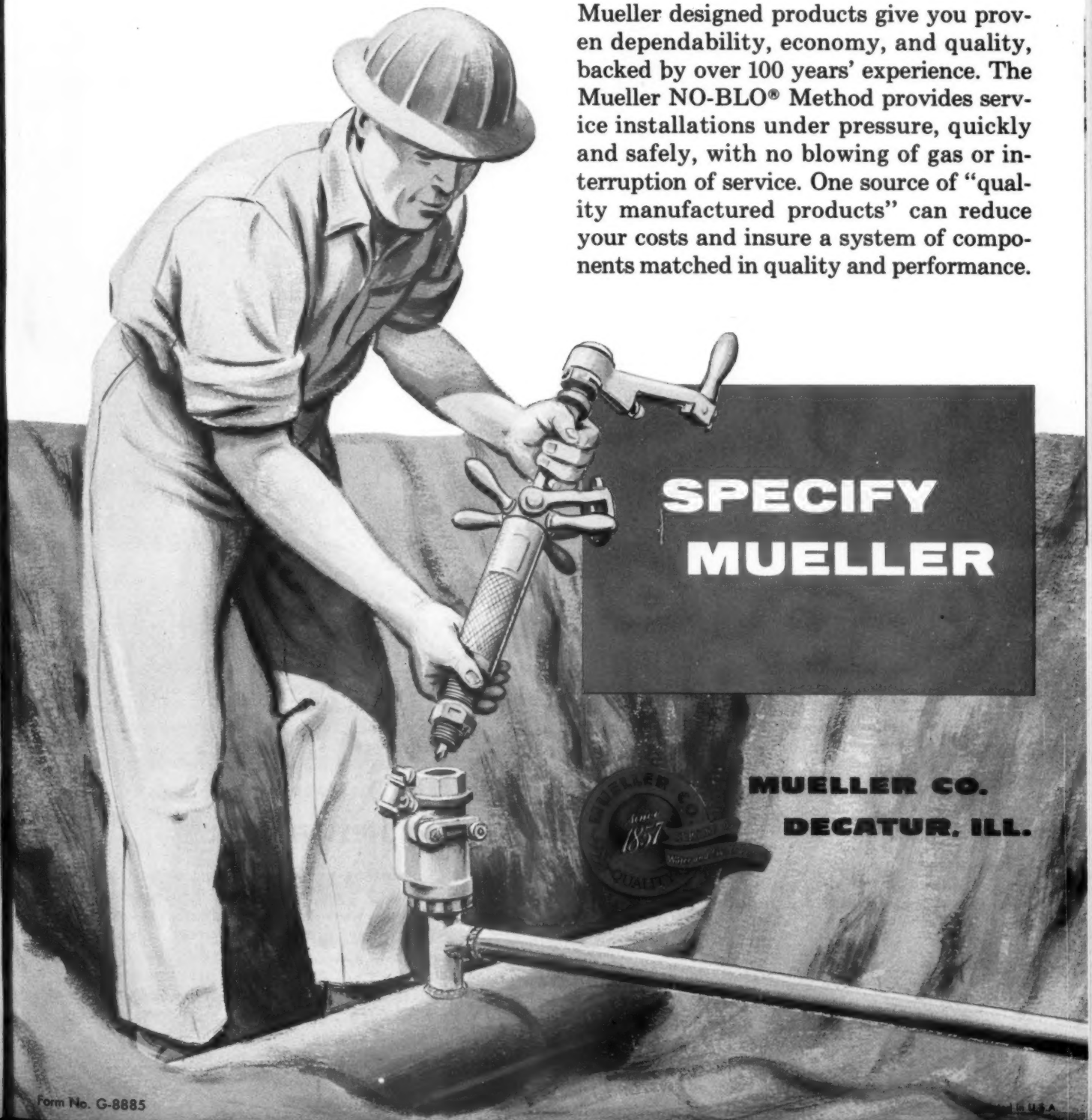

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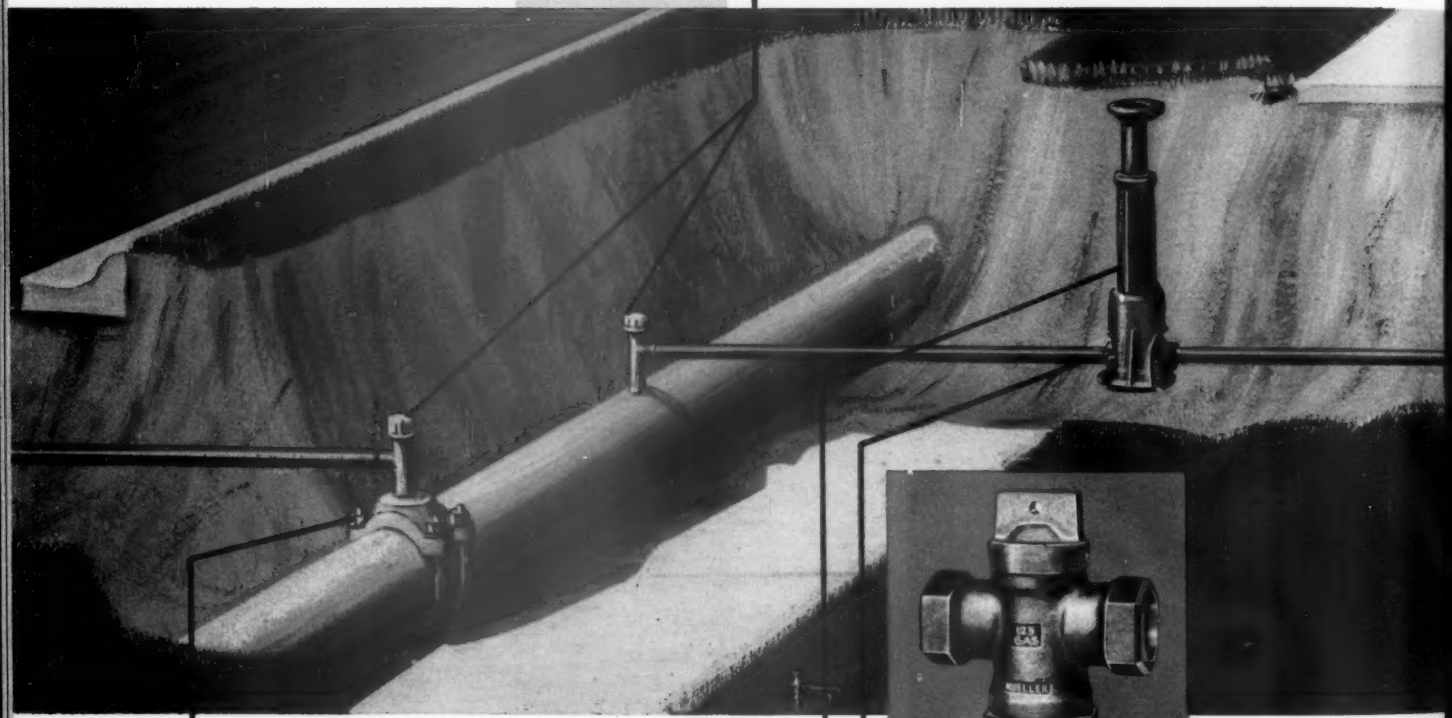

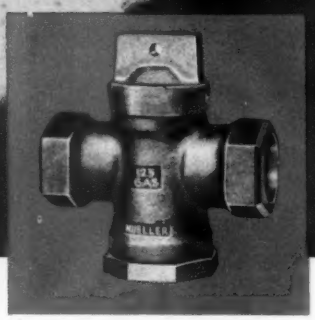

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for quick, safe connections to any type main under pressure . . . single or double strap type for 1" to 12" nominal size mains . . . variety of tap sizes . . . neoprene gaskets cemented in place for installation ease, positive seal and long life.

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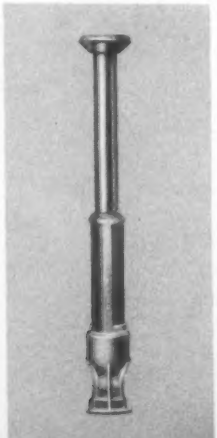
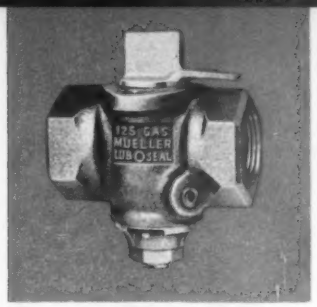
ground key construction . . . precision machined and lapped to insure gas-tight closure . . . inverted key stops available in a variety of end connections . . . forged-steel No-Blo valves available for high pressure service—threaded or welded service connections.



CURB BOXES

telescopic type to prevent damage to stop or piping . . . large steel upper section will not revolve in base . . . iron to bronze threads prevent seizure, assure easy plug or lid removal . . . with or without stationary rod . . . coated inside and out with tar base enamel to increase resistance to corrosion . . . separate footpiece supports stop and interlocks with curb box—prevents stop from twisting or turning when opening or closing stop.



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ground key construction . . . precision lapped and fitted for gas-tight closure . . . LubOseal® model with "O" ring seals and lubricated key offers absolute protection against frozen keys . . . variety of sizes and end connections . . . forged-steel stops available for high pressure service—welded or threaded connections.

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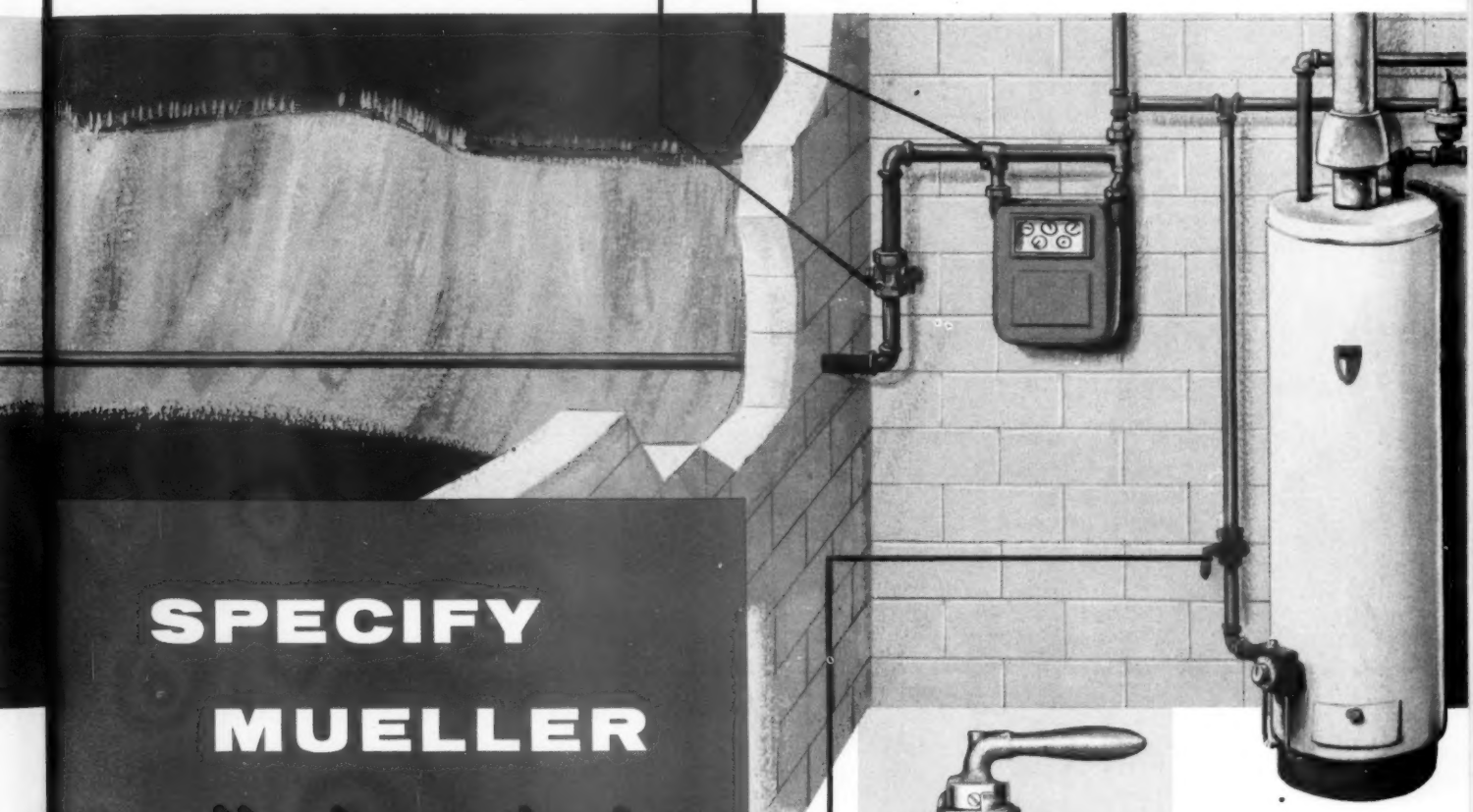

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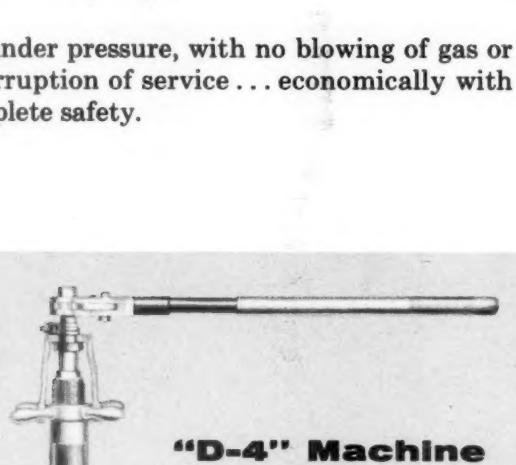
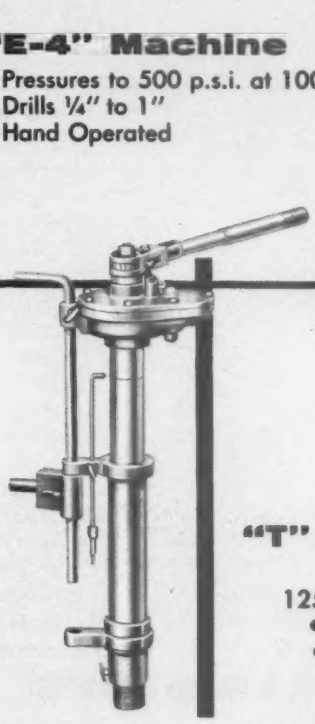
all under pressure, with no blowing of gas or interruption of service . . . economically with complete safety.

"E-4" Machine
- Pressures to 500 p.s.i. at 100° F.
- Drills ¼" to 1"
- Hand Operated



"D-4" Machine
- Pressures to 500 p.s.i. at 100° F.
- Drills ¼" to 2⅛"
- Hand Operated



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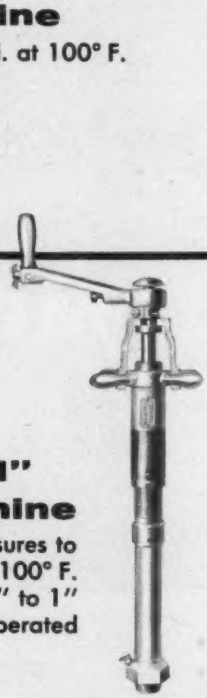

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Profile by Gas Light

Sparky Webber's Latest Milestone

CLAUDE H. WEBBER, noted innovator of the gas industry in the western states region, closes out a 46-year career on August 15. On that day, Webber, known throughout the West as "Sparky," retires as vice president and superintendent of the gas division of The Tucson Gas, Electric Light and Power Company of Tucson, Arizona.

Forty-six years ago this summer, Sparky Webber entered the gas business as manager of the Southwest Gas Company, which served Hemet and San Jacinto, near Riverside, California. Born in Minnesota, he came to California as a youth in 1900 with his parents. His entire adult life has been spent on the management side of the gas industry.

From 1912 to 1917, he ran the Southwest Gas Company. From 1917 until 1920, he was manager of gas operations for the City of Redlands, California. Between 1920 and 1922, Sparky Webber merchandised gas appliances in Los Angeles, and in 1922, forsook California and moved to Tucson, Arizona, to become superintendent of the gas department of The Tucson Gas, Electric Light and Power Company.

In 1922, and in his new post, Sparky Webber headed a gas department that had only 2000 customers and 30 miles of gas distribution mains. There were nine employees — six plant men and three outside men. As he retires in mid-August, Sparky Webber leaves a gas department boasting 56,000 gas customers and 855 miles of gas distribution mains. Today, the department has 150 employees, and delivers more gas in a 24-hour period than it did in a 365-day year back in 1922.

Thus in 1922 began the 36 years of unbroken service in the Tucson community, and the series of milestones that have marked Sparky Webber as one of the great innovators of the gas industry.

The first milestone came in 1922, shortly after Webber took over management of the gas department of the Tucson utility. It consisted of his designing and converting the old Tucson system to a pressure control distribution system, using all-welded steel mains. Welded steel mains in 1922 represented a brand new approach to converting an old gas distribution system to a pressure control system. Welded steel pipe was just coming into use. Webber's conversion of the ancient Tucson system was one of the first in the West.

C. H. "Sparky" Webber

So well was it designed that, in later years, when swift growth and development of the Tucson community pushed Tucson Gas and Electric to the utmost to keep abreast with demands for the nucleus of the system that had been designed and installed in 1922 was still adequate and no major design changes have been required since. And that "since" represents a growth in customers from 2000 to 56,000. That was milestone No. 1.

Milestone No. 2 came in the late 1920's. The Tucson utility manufactured its gas from fuel oil. No coal had been used by the company in many years. Webber evolved a new process — another first in the industry — that combined fuel oil and butane as raw materials.

The result: More uniform quality, cleaner gas, and materially reduced cost to the company. The butane-fuel oil combination, once Webber had proved its value, came into considerable use by other gas utility companies using fuel oil.

The third milestone was also a milestone in the history and development of the gas industry in the West. It was the arrival, in 1934, of the natural gas line to Tucson. Webber planned and supervised the change-over, which by this time involved 5600 customers of the gas department of The Tucson Gas, Electric Light and Power Company.

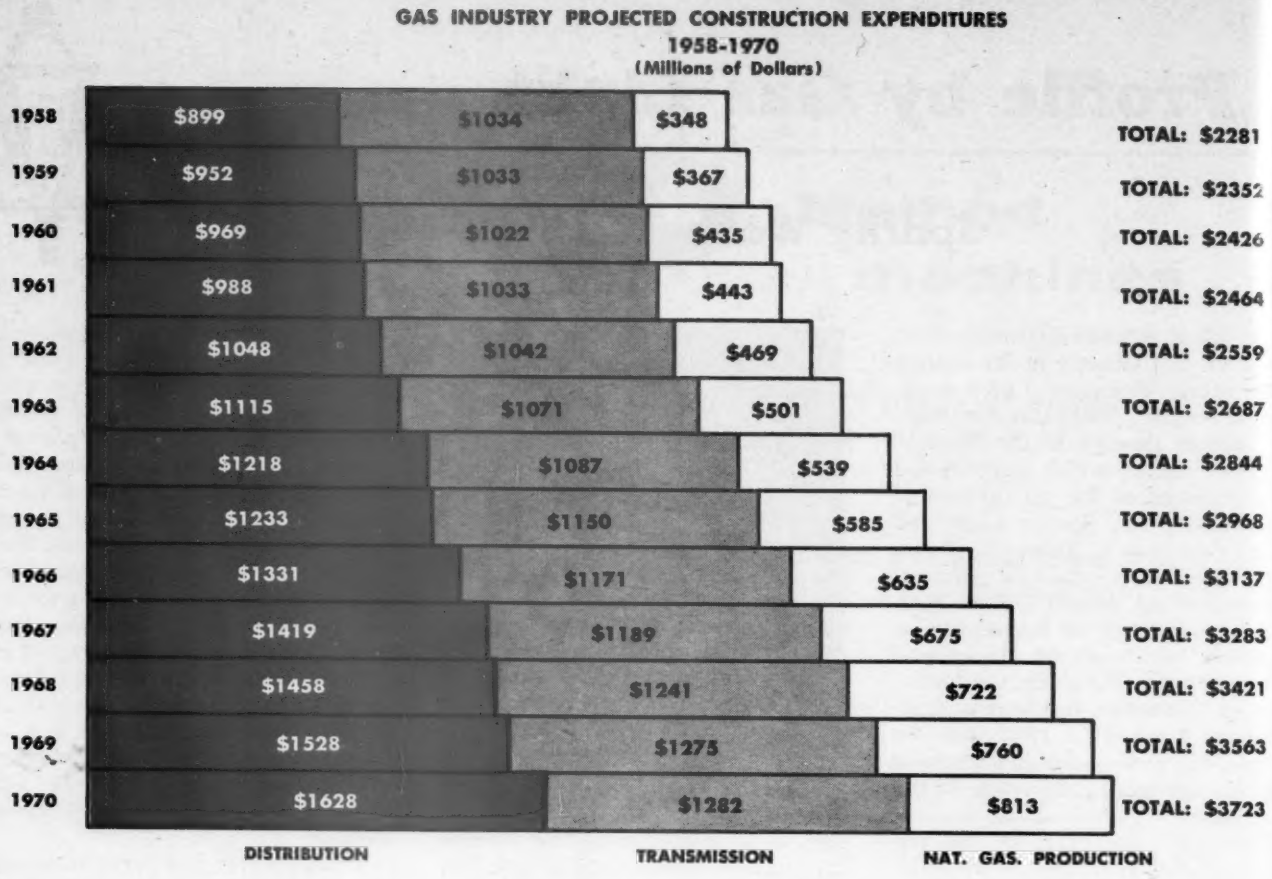
In 1952, Sparky Webber came up with his final great innovation — again a first in the gas industry. He was the first to install plastic pipe as part of a natural gas distribution system. Two-inch plastic pipe was installed in the Marana district, northwest of Tucson, in that year, and since that time, Webber has installed 80,000 feet of plastic pipe with great success. Of great advantage in the Southwest is the resistance of plastic pipe to the corrosive effects of "hot spots" in the soil, laden as they are with electrolytic activity. Another great advantage, as first reported by Webber, is the extremely low cost of installation due to the light weight of the pipe and ease of solvent welding.

When Webber first began to lay the plastic pipe, its producers had not solved one serious problem. There was no acceptable method for taking off a plastic service line from the main. Sparky Webber invented and patented a service fitting adapted to solvent welding of the plastic lines to plastic mains. The service fitting underwent searching tests in the Tucson gas distribution system, passed with flying colors, and is now produced and marketed by a national concern.

Sparky Webber, as he retires, looks back on 46 years in the gas industry, 44 of them as a member of the Pacific Coast Gas Association, and 25 years with the American Gas Association where he has served on numerous committees. In Tucson, he is a member of Tucson Elks Lodge No. 385, a Past Exalted Ruler and an Honorary Life Member; a member of the Old Pueblo Club, and a 26-year member of the Arizona Automobile Association.

For many years, Sparky and Mrs. Webber have summered and vacationed at Laguna Beach. This past year, they have completed a brand new home in South Laguna, where Sparky Webber will live from now on — except when he's back in Tucson for a visit.

While he is retiring from the active operational duties, he still expects to carry on his experimental and development work connected with plastic pipe for gas distribution, particularly pertaining to direct promotional activities.



The Outlook to 1970 . . .

Distribution Growth To Pace Gas Industry

Dean Hale, *Editor*

EXPENDITURES BY THE NATION'S GAS DISTRIBUTION COMPANIES in the period of 1958 to 1970 will contribute more than 41.8 percent of a total of more than $37.7-billion projected expenditure by all three segments of the gas industry.

These nearly 1000 gas distribution companies will spend approximately $15,786,000,000 in this 13-year period to provide facilities for serving more than 13,330,000 new customers.

These are some of the revealing figures brought out in an analysis by American Gas Journal's staff of a recent study released by the American Gas Association's Bureau of Statistics.

Historically, AGA's forecasts have been on the conservative side. The AGJ staff believes the rate of growth will be even greater than the AGA report indicates.

To determine just how much the gas distribution industry will grow from now to 1970, the AGJ staff analysis was directed toward providing an even more definitive breakdown of distribution company expenditures — particularly in two categories of vital importance – construction expeditures and projected miles of mains and services to be laid.

The AGA report's projections for miles of new mains and pipelines to be added to the already vast network does not include service lines – an item that consumes a considerable chunk of gas distribution company construction expenditures in materials, manpower, and construction equipment requirements. Nor does the AGA report include expenditures for replacement of mains and services – another important distribution cost item.

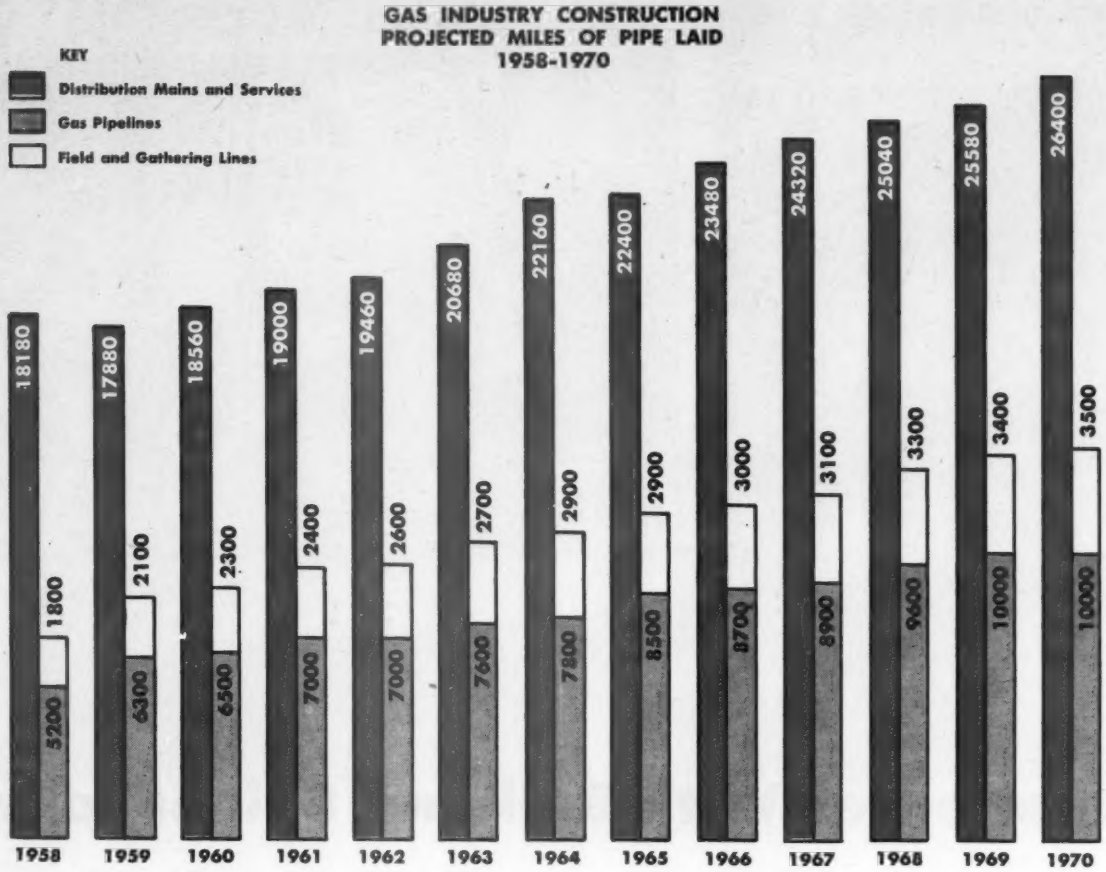
Similarly, the AGA study lumps together expenditures for natural gas exploration, drilling, and production with expenditures for local storage, gas manufacturing facilities, and peak shaving facilities. The AGA report also does not distinguish between pipeline, company and distribution company expenditures for underground storage facilities.

By breaking down these "lumped" expenditures into the component parts to be spent by each of the three major gas industry segments – distribution, pipeline, and natural gas production — the AGJ staff analysis provides a clearer picture of the projected expenditures of the gas industry's three

TABLE 1. Gas Industry Growth, 1958-1970.

	Gross Plant*	Customers Added**	Industry Construction Expenditures
1958	$18,518	860,000	$2,281,000,000
1959	20,557	860,000	2,352,000,000
1960	22,659	870,000	2,426,000,000
1961	24,791	900,000	2,464,000,000
1962	27,007	920,000	2,559,000,000
1963	29,334	960,000	2,687,000,000
1964	31,799	1,020,000	2,844,000,000
1965	34,373	1,050,000	2,968,000,000
1966	37,096	1,110,000	3,137,000,000
1967	39,948	1,140,000	3,283,000,000
1968	42,920	1,180,000	3,421,000,000
1969	46,017	1,210,000	3,563,000,000
1970	49,254	1,250,000	3,723,000,000

*As of December 31.
**Net gain for year.



individual segments in the 1958-1970 period.

Here are some of the highlights of the staff study of the AGA report:

- Gas distribution construction expenditures in 1970 will total $1,628,000,000 for 43.7 percent of the industry's total, contrasted to $899,000,000 in 1958 for 39.4 percent of the industry's total.
- *During the 13-year period, more than 283,140 miles of mains and services will be laid by the distribution companies, not including replacement mains and services.*
- **Total number of customers will increase nearly 45 percent. Approximately 13,330,000 new gas customers will be added.**
- Gas sales in 1970 will total 153-billion therms, more than double the 1957 figure of 75.7-billion therms.
- *Revenues from ultimate customers will be up 162 percent from 1957, reaching an annual total of $10.7-billion.*
- **Nearly 85 percent of all residential consumers in 1970 will be home heating customers, twice as many as 1957's 17,000,000 for 62 percent.**
- Employment will increase from 209,000 in 1958 to 266,000 in 1970, while payrolls will jump from $1.055-billion to $2.580-billion in 1970.
- *Gross plant of the entire gas industry estimated to be $49.3-billion by the end of 1970, a 194 percent gain over the estimated $16.7-billion in use at the end of 1957.*
- **Transmission company construction expenditures will grow at a modest rate while considerably more substantial increases will be necessary for new construction and expansion of distribution facilities, local storage and peak shaving, underground storage facilities, and for natural gas exploration-drilling-producing.**

Acknowledgment

Appreciation is extended to Daniel Parson, director of the Bureau of Statistics of the American Gas Association and his staff for use of the AGA report and for valuable assistance in undertaking this analysis. ★ ★ ★

TABLE 2. Projected Gas Customers by Class of Service, 1957-1970.*
(Thousands)

	Residential Heating and Cooling	Other Residential	Commercial	Industrial and Other	Total
1957	17,099	10,932	2,160	169	30,360
1958	18,100	10,720	2,230	170	31,220
1959	19,240	10,360	2,300	180	32,080
1960	20,430	9,970	2,370	180	32,950
1961	21,700	9,520	2,440	190	33,850
1962	22,980	9,080	2,520	190	34,770
1963	24,330	8,600	2,600	200	35,730
1964	25,670	8,190	2,680	210	36,750
1965	27,060	7,770	2,760	210	37,800
1966	28,420	7,420	2,850	220	38,910
1967	29,770	7,120	2,950	220	40,060
1968	31,100	6,870	3,040	230	41,240
1969	32,350	6,720	3,140	240	42,450
1970	33,620	6,590	3,240	250	43,700

*Average number during the year.

TABLE 3. Projected Gas Sales to Ultimate Consumers, by Class of Service, 1957-1970.
(Millions of therms).

	Residential Heating and Cooling	Other Residential*	Commercial	Industrial and Other	Total
1957	16,692	8,978	6,882	43,131	75,683
1958	17,570	9,910	7,080	45,160	79,720
1959	18,890	10,450	7,550	47,350	84,240
1960	20,280	11,000	8,040	49,600	88,920
1961	21,780	11,580	8,590	52,090	94,040
1962	23,340	12,180	9,180	54,440	99,140
1963	25,030	12,810	9,800	57,050	104,690
1964	26,760	13,470	10,470	59,800	110,500
1965	28,620	14,180	11,180	62,820	116,800
1966	30,520	14,910	11,920	65,930	123,280
1967	32,470	15,680	12,790	69,090	130,030
1968	34,450	16,480	13,730	72,650	137,310
1969	36,400	17,310	14,690	76,550	144,950
1970	38,420	18,170	15,710	80,300	152,600

*Includes "other residential" use of *all* residential customers, including those using gas for heating and/or cooling.

FIG. 1. Close-up of the cleaning machine showing the cutter wheels which flail the inside of the joint.

FIG. 2. The cleaning machine in motion.

Experiences With Bell and Spigot Joints Sealed by the Fuelling Method

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IN 1956, the Fuelling method was mentioned as an experimental method of sealing bell and spigot cast-iron joints. Since then a great deal of experience has been gained which may answer the question of how good is the adhesion of the plastic seal to the pipe. Before relating experiences and tests, a brief description of the Fuelling method will be given for those who may be unfamiliar with it.

Two operations are needed to successfully seal bell and spigot joints by this method — cleaning and coating. These operations are performed by two different machines that incorporate a magnetic locating device to find joints inside of a gas main. The machines are propelled manually through a gas main, by means of ¾-in. quick coupled pipe. Operation of the machines is by compressed air, which is controlled electrically by solenoid valves.

To locate the first joint, the cleaning machine is inserted up to 400 ft into the pipe and slowly withdrawn until a light flashes on the control panel. This indicates a joint has been found. The machine is then moved slowly back and forth until a maximum deflection of the instrument pointer is noted. This maximum deflection indicates the center of the joint. The machine is then withdrawn a predetermined distance, bringing cutter wheels directly in line with the joint, and the air motor is motivated causing the cutter wheels to flail the inside of the pipe. After two or three minutes, the pipe has a clean surface for approximately three inches on each side of the joint and the rest of the section of main is then located and cleaned in the same manner.

Coating Operation

During the cleaning operation, the coating machine is loaded with a compound based on *Thiokol* liquid polymers and catalyst into separate reservoirs. The coating machine is inserted into the main and the most remote joint is located in the same manner as in the cleaning operation. At that joint, locking mechanism braces the machine in the pipe and jets of air are blown onto the joint, removing any loose scale or dirt.

The Thiokol polysulfide sealant and catalyst is then forced separately into the mixing chamber, mixed and ejected onto the pipe. Rotating paddles spread and force the sealant into the joint space and a 6-in. wide coating, approximately ⅛-in. thick, is applied to the inner circumference of the pipe. Flow of the material is electrically metered enabling the operator to determine how much material is remaining and to coat each joint uniformly.

Checking Joint Seals

On certain test cases, bar-hole readings are taken before and after the joints have been coated to determine if the joints have been properly sealed.

FIG. 3. Coating machine mixes the compound and paddles it onto the inside of the joint.

FIG. 4. Coating machine being lowered into a trench. Pipe and cable fittings will be placed on in trench.

Bar holes are drilled along the run of the pipe and readings are taken in the holes with a Davis M5 Vapotester. A table of readings from a typical job is given in Table 1.

With the lack of odor in natural gas, a mercaptan odorant is needed to inform consumers of the presence of natural gas. A test was established to determine if the odorant added to natural gas would have any adverse effects on the compound used by the Fuelling method. Specimens of the sealant were placed downstream from an odorizing station and periodic observations were taken. The mixture at the test point was 0.25 lb of mercaptan odorant per MMcf of gas plus 0.5 lb per MMcf previously added by the pipeline company. At the end of 16 months, the specimens showed no change in dimensions, tensile strength or resiliency.

A test bell and spigot cast-iron main was coated by the Fuelling method to determine if changes in pressure would affect the coated joint. Every other day for two weeks the internal pressure in the test main was alternated between 0 and 50 psi and no leaks were detected.

TABLE 1. Summary of Gas Leak Readings Before and After Sealing by Fuelling Method.

White Plains Post Road—Scarsdale		Number of Bar Holes	Number of Readings			
Date	Condition of Gas Main		Zero	A	B	C
3-20-56	Before sealing	84	48	7	29	0
3-27-56	Befor sealing	84	43	15	26	0
5-29-56	Main out of service—no gas	84	52	31	1	0
6-22-56	12 days after sealing	84	80	3	1	0
8-20-56	71 days after sealing	84	82	2	0	0

The A readings indicate from 0 to 5 percent gas by volume.
The B readings indicate from 5 to 45 percent gas by volume.
The C readings indicate from 45 to 100 percent gas by volume.

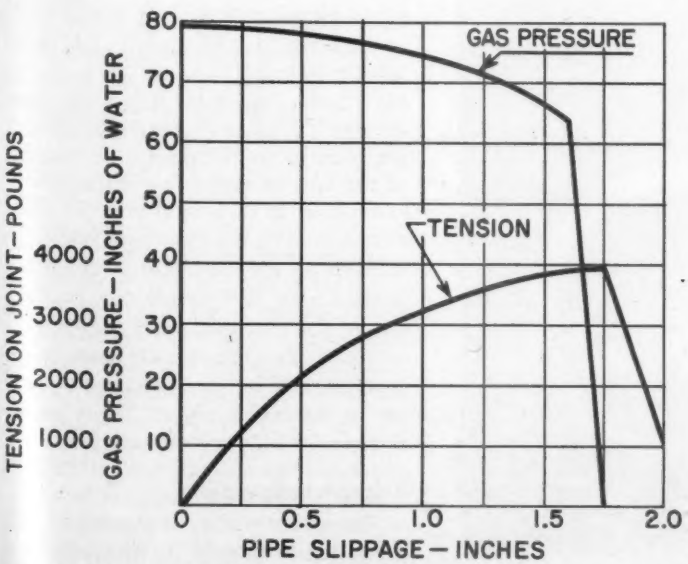

FIG. 5. Curve illustrates relationship between gas pressure and tension on joint from zero slippage to 1¾-in. slippage, when joint broke.

Coating Effectiveness Tested

A test was made on a 12-in. diameter cast-iron bell and spigot pipe joint to determine the effectiveness of the inner sealant coating. The joint was packed with jute and the inner surface

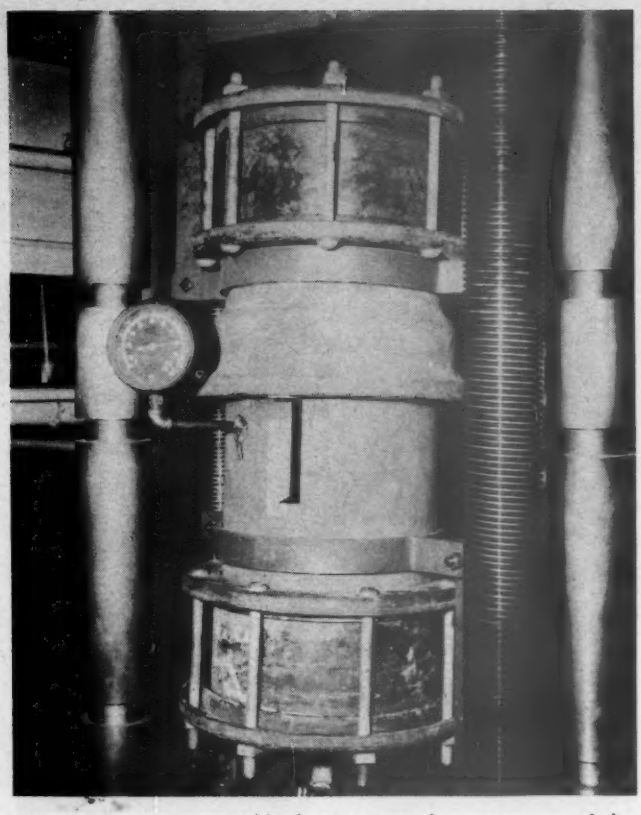

FIG. 6. Tension test assembly showing internal gas pressure and slippage indicator setting at the beginning of the test. Note internal gas pressure at 79-in. of water and pipe slippage indicator at zero.

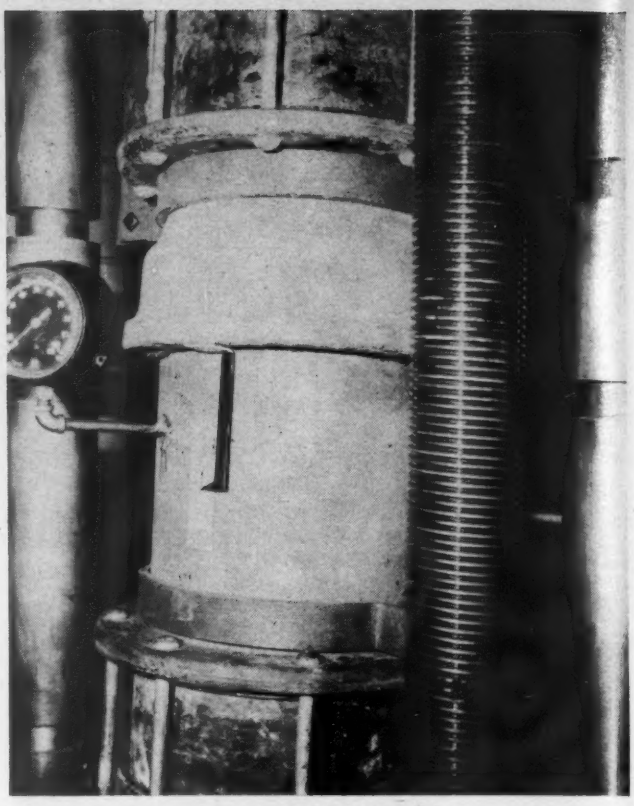

FIG. 7. Location of the pipe slippage indicator immediately after the gas pressure dropped to zero.

of the pipe at the joint was coated with sealant by the Fuelling machine. The test consisted in applying tension to the joint and measuring the change in the internal gas pressure and the slippage of the pipe in the joint. At the beginning of the test, the internal gas pressure in the assembly was 79-in. of water. Tension was applied to the assembly at such a rate to produce a separation of 0.05-in. per minute. Readings of the gas pressure and joint slippage were taken every ⅛-in. of joint separation, giving the curve shown in Fig. 5.

The gas pressure decreased because of the increase in volume due to the stretching of the sealant when tension was applied to the pipe. When the tension on the joint reached 3950 lb, the internal gas pressure dropped to zero indicating the sealant had broken. Pipe slippage, when the joint was broken, was 1¾-in. Inspection of the joint after the test showed that the Thiokol compound had broken even with the end of the inner pipe in the joint. Thus, the force of adhesion to the inside of the pipe is greater than the tensile strength of the material.

FIG. 8. Close up of the joint showing that the sealant coating had broken evenly with the end of the inner pipe in the joint.

Cost Studies

Several cost studies have been made on sealing 12-in. cast-iron gas mains by the Fuelling method. Based on these studies, it appears that the average cost per joint is approximately 33 percent of the cost of sealing by external leak clamps. In 1956, a total of 1721 joints were sealed by the Fuelling method. In addition to the savings it is important to realize the favorable public reaction due to the fact that street excavations for access into the pipe are made on an average of 600 ft as compared to having an excavation every 12 ft to install external leak clamps at every joint.

Acknowledgment

The author wishes to express his appreciation to George A. Brown for his assistance in preparing this material.

* * *

Better tools, better practices have met the challenge of higher pressures and phenomenal growth, promoting both . . .

Economics and Safety in Gas Distribution

In order to make this discussion more understandable it might be well to define some of the terms used. "Gas Distribution" may be defined as, "the method and means of delivering to the consumer sufficient quantity of acceptable quality gas at adequate and uniform pressure with the maximum safety and minimum overall cost. "Economics," as referred to here, will be defined as, "the recovery of value from costs." And "Safety" will be defined as, "the practices, procedures, and specifications calculated to prevent or reduce the severity of accidents."

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ECONOMICS AND SAFETY are, for the most part, inseparable. In general, an unsafe practice is also uneconomic It has been said that "there is no compromise with safety." This statement can be questioned, since absolute safety is only an ideal when considering anything potentially hazardous.

For example, in the case of automatic gas hot water heaters, an explosion from overheating the water could never occur, if the thermostatically controlled gas valve never failed. Since the probability of this occurring seems to be greater than an acceptable minimum, codes often require the use of a temperature relief valve on hot water heaters. By the addition of this device we have reduced the probability of a simultaneous failure of both devices to a degree where it is probably acceptable, but it is not absolute.

Even if we continue to add other devices to perform in case of malfunctioning of these two devices, we would only continue to reduce the probability of a simultaneous failure but never reach the point where it could not occur. Hence, it seems to me that the pursuit of safety is the effort to reduce the probability of an accident to an acceptable minimum.

There are certain areas where economic and safety objectives are definitely opposed to each other. The fundamental one is distribution pressure. Unquestionably, the safest way to transmit and distribute gas would be to use pressures in the area of appliance pressures, that is, inches of water column. If all gas today were distributed at such pressures, the cost to the consumer would be prohibitive. Here is a case, then, where the economic consideration dominates, and the safety consideration becomes a challenge to the gas industry and the manufacturers who supply this industry. While there remains a great deal to be done, great progress has been made in meeting this challenge.

Pressures Have Increased . . .

Although gas pressure began to increase in certain areas as much as 30 years ago, the great trend upward on a national basis probably began about 1945.

No figures on average gas distribution pressure seem to be available, but by calculating pressures that might be required on the basis of the amount of natural gas distributed and the miles of mains in existence, and by making some assumptions a curve that probably represents the trend of gas distribution pressures can be determined.

It was found that this curve followed rather closely the plot of the average number of natural gas customers over the years. This relationship does not seem unreasonable. Such a curve does not represent any particular company, because those companies that were distributing manufactured gas at appliance pressures have had much greater increases in pressure when they distributed natural gas. Companies that were distributing natural gas relatively early have probably not had these same increases in the later years.

In fact, there seems to be some indication that distribution pressures may level off at 50 or 60 psig, which is considered by some a happy compromise between economic distribution and safety considerations. Such thinking was reflected in the ASA B31.1.8 Code for Gas Transmission and Distribution Piping Systems.

. . . And So Have Problems

The increase of pressure from relatively low values to those used by many companies today has been an economic solution to the major gas distribution problem, but it intensifies the ever-present problems of leakage and safety.

Obviously, with a given system increased leakage will result from increased pressure. This will depend upon the nature and number of all the leaks in a system. Large leaks, such as actual breaks or holes in the piping, do not increase with pressure nearly so much as small leaks which occur at joints, packings, valves, etc.

Increased leakages not only result in appreciable lost revenue but also result in other costs to the gas company. Leakages that may have been un-

noticeable at low pressures become noticeable at higher pressures and result in service calls, if they do not actually approach the point where they would become a potential hazard.

Obviously, a distribution system that might have been satisfactory for appliance pressure may not be satisfactory for modern distribution pressures.

Improvements Also Great

Among the many forward strides the gas industry has taken to combat these difficulties, several are outstanding. The first is the **improvement in pipe and pipe joints,** both the mechanical joint for cast iron pipe and the tremendous development in the welding technique for steel pipe. Without the development of the welding technique to the fine point it has reached today it is doubtful if modern gas distribution could exist.

The second great development in the industry has been that of **corrosion prevention.** The latter has been accomplished through the development of satisfactory wrapping and coating of pipe plus the prudent use of insulating joints and cathodic protection.

In fact, this science has developed to the point where there seems to be a definite trend toward the use of lighter wall steel pipe. On a recent housing project in California where the soils range in resistivity from 370 ohms per cm to 3400 ohms per cm 0.125-in. wall — 2-in. pipe, 0.148-in. wall — 3-in. pipe, and 0.165-in. wall — 4-in. pipe were installed at a saving per mile on the steel pipe of $300, $800, and $1100 respectively. The installed cost of cathodic protection average $125 per mile. Here is a case where there was not only an economic advantage, but the result and installation would certainly be calculated to have a much longer life and contribute materially to safety.

A third factor that has contributed immeasurably to gas distribution safety has been the **development within the gas companies, themselves, of safety divisions and the development of standard practices and procedures, as well as intensive training programs for gas company personnel.**

To quote the conclusions offered by W. M. Henderson after 50 years' experience in the gas business, "*Accidents don't happen — accidents are committed.*" If we ever hope to achieve an optimum of safety, it will only be accomplished by properly trained people who intelligently use the equipment and instructions given them. The human factor in safety is going to be one that will never be completely solved but certainly deserves the most intent and unrelaxing effort to achieve as high a level as possible.

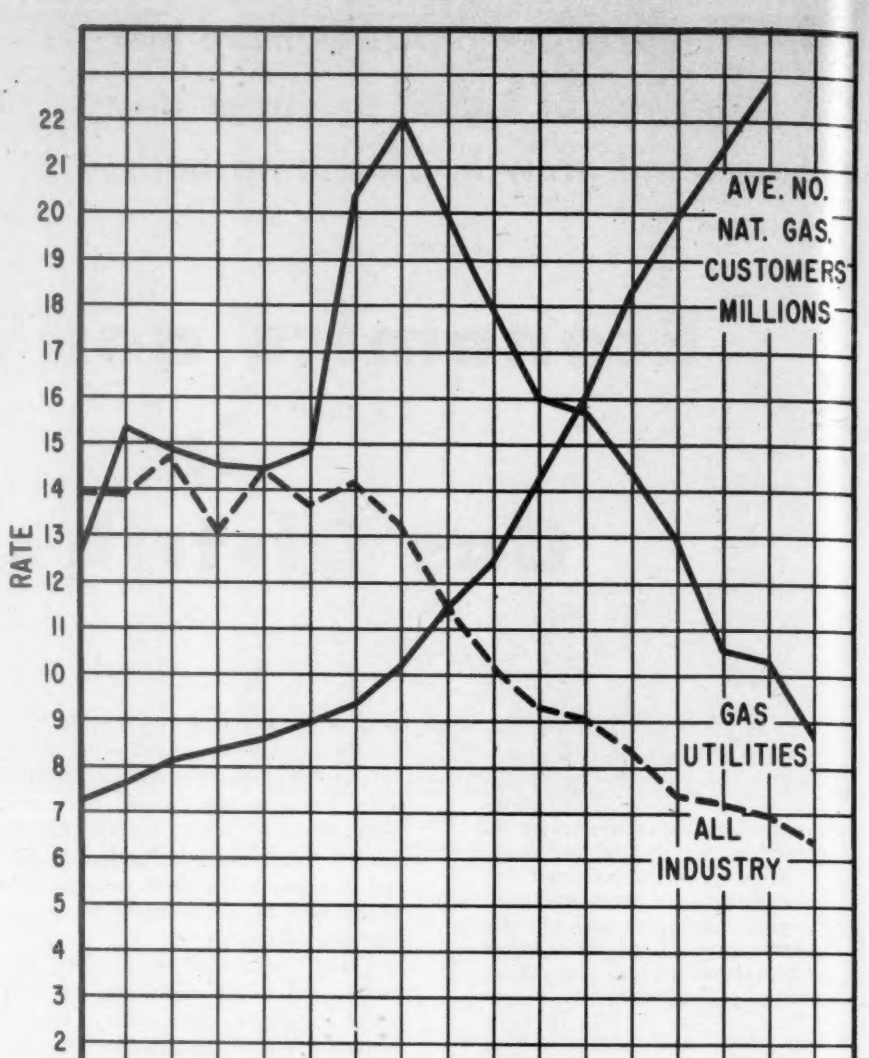

FIG. 1. Graph shows relationship of increase in natural gas customers to frequency of disabling injuries per million man hours work in the gas utilities. All industry frequency average is shown for comparison.

A relatively recent and vitally important contribution to the problems of gas distribution has been made by the issuance of the ASA B31.1.8 Code for Gas Transmission and Distribution Piping Systems.

To quote again from a paper presented by W. M. Henderson, "*The gas business is a rather loose knit industry. There is no central control to establish and enforce a policy. So the sins of neglect by some, distract from the virtues of the others. As evil only gets a press, the industry as a whole suffers.*"

It seems to me that Section 8 of the B31.1 Code is an important attempt to bring to the gas business as a whole the best practices to raise the level of the whole industry.

Natural Gas Brought New Problems

High-pressure distribution and particularly the distribution of high-pressure natural gas, brought with it a revolutionary change in the practices and procedures of the gas companies. On the old low-pressure gas systems it had long been the practice to let the gas blow while performing some necessary operation, such as a service connection, and it was not difficult to stop off gas mains with gas bags and similar equipment. These practices were dangerous and impractical as pressures began to go up. High-pressure equipment for performing all of these operations without the escape of gas was developed and has been largely adopted by the gas industry.

Although in many instances this

equipment is required simply to overcome the mechanical difficulties involved in working on high-pressure gas, there is another inherent characteristic of natural gas that was not known in the beginning and is perhaps not generally appreciated even at this time.

While manufactured gas was generally saturated with moisture, natural gas is extremely dry. Being dry, it tends to dry out the mains, resulting in appreciable dust being carried along with the gas.

It has been and can be demonstrated that natural gas carrying small dust particles and escaping into a relatively dry atmosphere can produce a high static charge in seconds on any insulated object that it strikes.

It is true that in general, the relative humidity of the atmosphere must be 40 percent or less for this condition to occur, but such humidities are often found and are not generally apparent. If this charged body, which may be a workman or some other object, then comes close to a grounded object, a spark will occur that can cause a fire.

If a workman's clothes are saturated with the gas, they will immediately burst into a flame. Thus, we have a condition peculiar to natural gas that did not exist in the case of manufactured gas, and one that requires the adoption of other methods for working on it even when the pressures are not so high as to require these methods from a mechanical consideration only.

It is the opinion of many well-informed people in this field that static electricity may well be the explanation for many mysterious fires, injuries, and fatalities to gas personnel. Here is a consideration where safety appears to be the dominate factor, and all work on natural gas distribution mains should be done with equipment which controls the flow of the gas at all times.

Tools Are Economical

Forgetting for the moment humanitarian considerations, let us look at the cost of equipment from a strictly economic point of view. Here again I would like to quote from a paper of Mr. Henderson's:

"We think of the worker in terms of wages paid per unit of time, but when we consider tools and equipment, we look at the price tag — the first cost.

"To balance the equation is simple if we adopt a common denominator — wages. Wages for tools, the same as wages for men.

"Wages for tools and equipment are the total charges for use of the purchase money, that is, interest plus depreciation to amortize the cost within the useful life.

To illustrate, let's invest $100 in a tool. The wage for the cost at 6 percent per annum, paid monthly is 50 cents; depreciation, based on four years of useful life, or approximately 24 percent per annum, adds $2 monthly. Then the total fixed charges to possess the tool and retire it at four year intervals is $2.50 a month.

"On a work month of 21 eight-hour days, or 168 hours, the $100 tool wage is $2.50, divided by 168 hours, or 1½ cents a work hour. That is probably but half the wage paid for but one minute of one workman's time.

"The tool need recover as productive work only one man minute for every hour on the job; the tool then pays its wage — any additional production is clear profit.

"On the same basis, $1000 invested in tools or equipment costs but 15 cents per work hour, and a $10,000 investment only $1.50 an hour on the job. In other words, a $10,000 piece of equipment actually costs no more than one man.

"The worker sells time; if you fail to use it efficiently, you pay — time paid for but not used is a total loss. The tool cost, however, is only the carrying charge on the purchase price. When the tool is idle this charge is not a total loss, like unused time, for you still have the tool."

If we would look at the purchase of tools in this manner, it would appear that relatively expensive production improving tools can really result in savings.

Tools for Safety

But what about tools that primarily improve safety and do not contribute too much in the way of saving of the workman's time?

Let us consider one actual incident. This is a case reported on by the American Gas Association Accident Prevention Bulletin, Vol. I, No. 3, Case No. 8, October 1952.

The accident resulted in serious burns to six workmen, including a district superintendent and a foreman. Time lost, as a result of the accident, equaled 530 man days. The accident occurred when a crew was engaged in cutting through a section of 2-in. high-pressure gas main to install a valve. Pressure was reduced but maintained high enough to serve the district. A bond wire was installed across the proposed cut. The first cut was completed successfully, but upon completing the second cut, the gas caught fire and the two men who were doing the work, as well as the others who attempted to rescue them, were seriously burned. The source of the ignition was never determined.

After this accident, modern equipment that would permit the performance of this operation completely under pressure and without the loss of gas was purchased. This equipment not only would perform the job safely, but by the use of a by-pass permitted all services to be maintained in operation during the cut.

The costs of this accident were never specifically stated, but it has been estimated they were in excess of $10,000. These were the direct costs and to these would have to be added the costs for restoring services and all other indirect costs.

How much could have economically been spent to prevent this accident, forgetting for the moment the humanitarian consideration, would be problematical because no one can state the frequency of expectation of such accidents. It does seem, however, that a considerable yearly "wage" can be paid for equipment that will prevent such accidents.

Accidents Have Hidden Costs

Even viewing accidents from a strictly economic point of view, we seldom have a full appreciation of the complete costs of accidents. To properly evaluate this we must expose the hidden costs of accidents. H. W. Heinrich, speaking before the Edison Electric Institute reported that, "for every dollar of direct costs there are on the average $4 of indirect costs (the direct cost is the settlement cost). The indirect cost includes investigation by all parties, expert fees, attorney fees, court costs, work stoppage, adverse legislation, increased insurance rate, loss of public confidence, and even more."

As it will probably never be possible to accurately evaluate the costs of accidents, we can only surmise that they are probably very much more expensive than anyone actually appreciates, and that the words of Raymond W. White, manager, claims and safety department, Pacific Gas & Electric Company, are probably true when he says, "The price of safety is less than the cost of accidents."

Although there is evidence that the gas industry as a whole was not prepared for the transition from manufactured to natural gas, there is also evidence that there was a quick appreciation of the problems and a rapid effective response in meeting them. This is evident in the statistics published by the National Safety Council and by the American Gas Association.

Accident Frequency History

For a number of reasons it might be expected that accidents in the gas in-

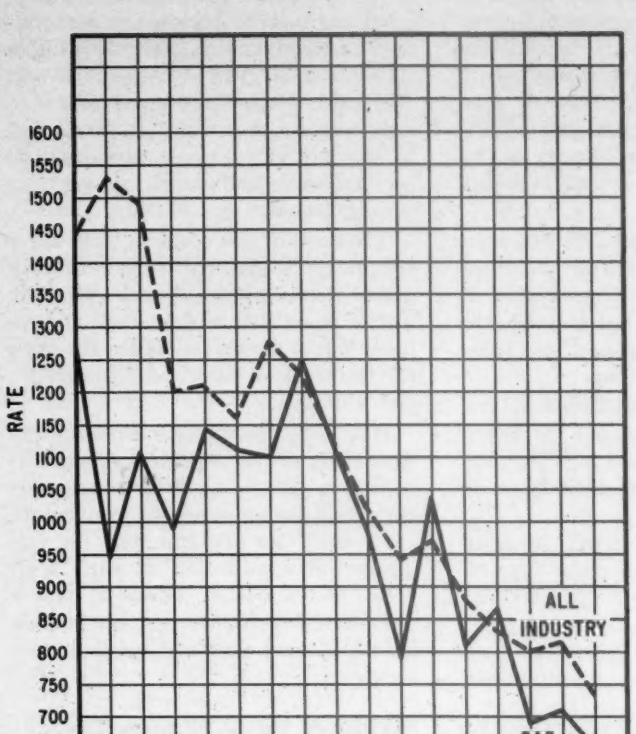

FIG. 2. Graph shows how accident severity rate (time charges in days per 1000 man hours worked) of gas utilities compares with average for all industries.

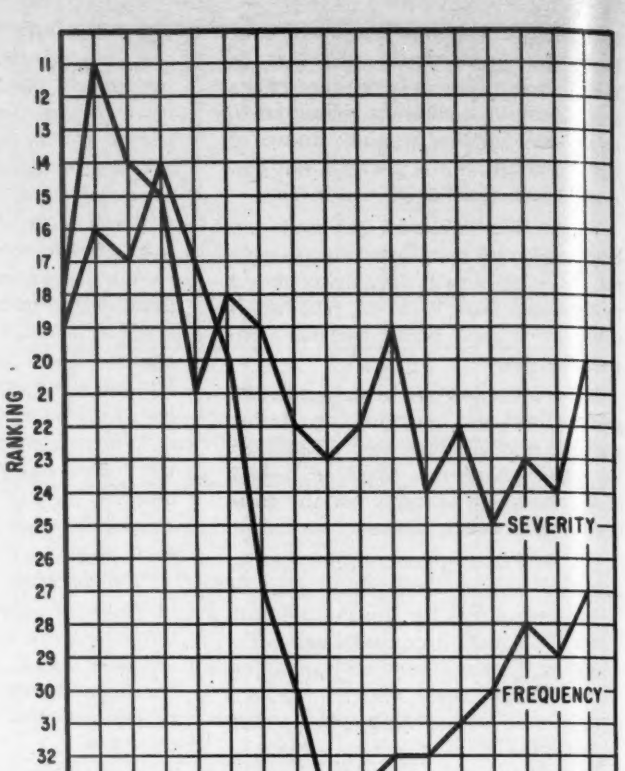

FIG. 3. Graph shows how gas utilities rank among 40 industries in both accident frequency and accident severity.

dustry would be related to the distribution of natural gas with its increasing pressures and other characteristics making it more hazardous. From Fig. 2 you will note that the average number of natural gas customers has risen from slightly over 7,000,000 in 1940 to almost 23,000,000 in 1955. It will also be observed that this increase was relatively slow up until about 1945, when a rapid increase began.

The frequency of accidents in the gas utility field, as measured by the number of disabling injuries per 1,000,000 man hours work, stayed between 14 and 15 until about 1945 when it started toward a very high peak. This was coincident with a sudden change in the rate of natural gas customers added.

Apparently, by 1947 the industry was aware of its problems and was taking steps to combat it, as the frequency rate began to drop and has been dropping rapidly ever since. This is in spite of an even increasing rate in the number of natural gas customers and the attendant problems. This speaks well for the gas industry.

It will be noted that, until about 1945, the frequency rate in the gas industry was comparable to the average for all 40 industries reported on by the National Safety Council. In 1945 the rate for the gas utilities went well above this line, and although it has been dropping more rapidly than the line for all industries, it has never yet achieved the position it held prior to 1945.

Accident Severity Record

In Fig. 2 the severity rate for gas utilities and for the average for all industries is plotted. The severity rate is the time charges in days per 1000 man hours worked. In respect to severity of accidents, the gas utilities were well below the average of all industry until about 1944 or 1945. At this time the average of all industry accident severity rates had dropped and the gas utilities had remained the same or gone up. It will be seen that the gas utilities rate has been dropping along with that for all industry and in the last few years has shown a favorable relationship.

Fig. 3 shows the position of the gas utilities in relation to the 40 industries reported on by the National Safety Council. Here it will be seen that, in severity, the gas utilities reached their best position of 11th in 1941 and have been dropping unfavorably to their worst position of 25th in 1953. Since then there has been an improvement to the 20th position in 1956. Frequency of accidents is not quite as favorable as the severity factor. In frequency, the gas utilities had their best position of 14th in 1943, and their worst position of 34th in 1948, since which time there has been an improvement up to 27th position in 1956.

Prevention Practices

In regard to the accidents occurring to gas utility personnel, it would appear that the industry has faced up to its problems and is effectively improving the situation each year. The problem is not solved, as indeed it never will be. However, it does indicate that the steps that have been taken were effective and that continuation of these efforts, with the addition of any new approaches that might offer promise, can improve the situation even further.

Through the National Safety Council, the American Gas Association, and particularly, the Accident Prevention Committee of AGA, there is a wealth of factual information available on industrial accidents in the gas industry. In fact, it seems that all of the information necessary to intelligently attack the problem is being provided.

For some reason, this same type of information is lacking in the realm of public safety. It seems that if the gas industry has been apprehensive that such information might be improperly

presented or used in a way to reflect unfavorably upon the industry. There is also the possibility that any independent investigation and reporting of public accidents might vary in its conclusions with those of other interested parties.

Despite these understandable objections, the inescapable conclusion remains that we can never hope to effectively attack the public safety problem without factual information on the causes of these accidents.

Admittedly, a picture of the national situation might have to be tempered somewhat by local circumstances, but there are undoubtedly common areas of major importance that would be apparent when such information was available.

Public Education Needed

Gas accidents involving explosions, fires, and property damage are very dramatic things. For this reason they receive considerable publicity in the local press. Too often the publicity does not continue to the point where the public is informed of the cause of the accident. As a result, this tends to create an unjustified fear of gas in general. It might be successfully argued that better publicity of the cause of gas accidents would actually be beneficial to the gas industry. Certainly, it seems that public education in regard to the safe use of gas might be worthwhile.

Properly presented, the information that has been available does not seem to me to be detrimental to the gas industry and in fact might be interpreted to be complimentary to it. Most of the information that appears to have been published on public gas accidents has been published by the National Fire Protection Association.

In 1956, only 21,000 out of 824,400 building fires were attributed to gas and gas-fired equipment. This is about 2½ percent. Gas was charged with about the same percentage of total losses, being about $24,500,000 out of a total loss of $1,016,000,000.

Although these percentages are small, the actual number of fires and the losses involved are quite large. On the other hand, lightning caused twice as many fires and twice as much loss as gas. Fires due to electrical fixed services, faulty wiring and equipment were about three times the number of fires caused by gas and resulted in losses about five times that of gas.

Though we may conclude that there is an appreciable problem in the realm of public safety insofar as the gas industry is concerned, a comparison with other things having inherent hazards would not reflect unfavorably on the gas industry and might even be to its credit.

What To Do?

In the past, the guide to improved public safety has often been based on local experience, catastrophic accidents that received nationwide publicity, fraternization with other gas men, and in some cases theoretical supposition.

Innumerable devices have been designed and marketed with the idea of improving public safety. Among these are:

1. Service relief valve,
2. Excess pressure shutoff,
3. Excess flow shutoff,
4. Low pressure shutoff,
5. Earthquake shutoff valve,
6. Fire shutoff valve.

There have been combinations of these and other devices not mentioned and undoubtedly all of these have applications to various degrees in the safety program. When we consider the staggering fact that there are over 30,000,000 gas services in the United States and the cost of equipping even a reasonable portion of them with various safety devices, we realize the absolute necessity of determining the actual cause of accidents and where money could be spent for the best results.

We can hypothesize all sorts of situations that might cause an accident. For instance, theoretically, the failure of a diaphragm of a house regulator should result in the regulator flying wide open and passing a maximum amount of gas. If such a thing happens, the ordinary built-in relief valve would not be adequate. Actually, I have never heard of a diaphragm failing in such a manner. If it is a fact that such failures do not occur, then any money spent in trying to improve the situation would be largely wasted.

Vigilance a Must

A very complete factual reporting of gas explosions and fires was contained in the January 1958 issue of QUARTERLY OF THE NATIONAL FIRE PROTECTION ASSOCIATION. In order to protect the interest of the gas industry the American Gas Association was instrumental in having the NFPA write an introduction to this publication. Certain quotes from this introduction seem pertinent to this discussion. I quote, *"The principal conclusion that could be drawn from these case histories is the ever present need for vigilance in the proper installation, maintenance, repair, and operation of gas piping and equipment.*

"Limited as it is to incidents involving gas piping and equipment, the study is in no sense a means of evaluating the safety of gas as a fuel and should not be used for that purpose. To anyone who might be misled into doing so, let it be said that the NFPA Fire Record Files contain experience to permit similar studies of most other fuels. Gas or any fuel can be safely used when proper installation and maintenance procedures are followed."

Another quote from this introduction is as follows: *"Many explosions in this record involve gas that has escaped from pipes broken by contractors' crews during excavation work. There were also several incidents where fire control was delayed because gas shutoff valves were inaccessible. Thus, another important conclusion from this study is the necessity of closer co-ordination of the activities of gas companies, contractors, and fire departments."*

In support of these conclusions an analysis of the NFPA data covering an eight-year period from 1950 through 1957 shows that of 43 explosions attributable to distribution piping, 21 of the accidents resulted from broken mains, the cause of which was not determined. Ten more resulted from leaking mains, five from mains that had been broken by other construction work, four from fitting failures, and three from allowing high-pressure gas to get into a low-pressure distribution system, either because of a human failure in opening a wrong valve or because of regulator failure.

Of the 21 explosions and fires attributable to service piping, 14 accidents were caused by breaking the service pipe as a result of outside agencies, such as ditching and digging machines; five resulted from corroded or leaking service pipe; and two from failure to properly close a valve or cap off a service pipe before turning on the gas.

In the realm of building piping the causes of the accidents are too varied to be classified. Here again, a number of the accidents occurred from pipes that had been broken as a result of other agencies, such as cave-ins, stacking material against the pipe, and overloading and sagging floors. Fire damage was increased considerably in many cases because a fire that started from some other source resulted in breaking a gas pipe and it was frequently very difficult to find a control valve and close it off.

Since some 64 accidents were caused by broken distribution mains or service pipe and by the gas then escaping into

a dwelling by following a water or gas service pipe, a sewer, an electrical conduit or simply by finding its way through the ground itself and through cracks in the basement wall, it would appear that effective safety devices on service pipes would be limited to a relatively few possibilities.

Industry Needs Data

Data studied here, however, is admittedly limited but points to the great service that could be rendered if this information were available generally to the gas industry and the manufacturers who service them.

Fortunately, work is under way at the American Gas Association to fill this need. Gas accidents in the area of public safety are being studied, analyzed, and tabulated so that in the future we might expect to have the kind of factual data needed to effectively attack the public safety problem.

Designs Need Upgrading

From both economic and safety considerations a good case could be made for upgrading designs. Most mechanical structures and devices deteriorate with age and use. At the same time the phenomenal growth of the gas industry has resulted in increasing pressures and probably will continue to do so for some time to come.

Often designs and specifications, which meet the immediate need or for some short time in the future, are outdated before we expect it. It would seen prudent to not only anticipate the conditions that must be met in the future but to realize that the system that must meet these future conditions will be considerably older and probably less able to do so when the time comes.

In this connection let us consider one example. Small leaks, such as those that occur at valves, joints, packings, etc., and which are probably multitudinous in any gas system, are **laminar flow phenomena.** The soundness of this assumption has been demonstrated by tests.

Leakage of this nature would increase according to the formula: absolute pipeline pressures squared *minus* atmospheric absolute pressure squared. Thus, if we started with a gas system distributing gas at approximately ¼-psi and raised that pressure to 1-psi, the increased leakage would be approximately four times. At 5-psi it would be roughly 23 times; at 10-psi, 53 times; at 30-psi, 240 times; and at 60-psi, 724 times.

This, of course, is on the assumption that nothing was done to change the leakage. By the same token, in going from 10-psi to 20-psi, increased leakage would be roughly 2½ times. A leak of 0.002 cu ft per hr or less is very difficult, if not impossible, to determine with an ordinary soap suds test. Such a leak might be of no consequence and almost undetectable at low pressure.

If the pressure were raised from 7-in. wc to 5-psi, the increased leakage would be about 23 times, and this same leak might now be approaching 0.05 cu ft per hr or roughly that of a pilot light for a gas range.

Although in most instances the increased leakage of this kind with increased pressure might not present any hazardous conditions, it would nearly always result in leaks becoming noticeable and resulting in the cost of extra service calls.

This same kind of analysis can be applied to higher pressures, as well as the low pressures used. It might be well then to consider that all designs should not only consider the expected conditions that might have to be met in the future, but the fact that the system being installed at this time must meet that situation at some future date, not at the present time.

Cooperation Needed, Too

There is one other facet to the problem of economics and safety in the gas industry that might well be improved. There is a need for better co-operation between the gas companies and the manufacturers in regard to product specifications and the development of new products.

Too often product specifications relating to performance and testing have been drawn up without apparent consultation with manufacturers resulting in unnecessary expense or impractical requirements. Manufacturers are more than willing to cooperate in all such projects, if asked to do so, and contribute vital information that will help in achieving the desired objective at the lowest cost.

The need for a new product or improvement in an existing product is quite naturally often apparent to gas company personnel before it is to the manufacturer. Many gas companies encourage and subsidize their employees in the development of products that they may conceive of to meet these needs. This is a healthy situation if it is not allowed to go too far. I believe there are many objections over and above the waste of time and money in permitting such a development to go beyond the point where the idea has proved workable and where it has been reduced to drawings, sketches, and a complete description.

Actually, there is little or nothing to be gained by the gas company or the employee in going beyond this point. At this point the inventor can either file for a patent or make duplicate notarized sketches and descriptions of the idea, which will adequately protect his contribution. From here on, the problem is rightfully in the domain of the manufacturer.

Extensive development work is the stock in trade of the manufacturer. He is better organized and prepared to perform the many and varied functions necessary for the successful development and marketing of a product. If a manufacturer feels an idea has commercial possibilities and novelty, he often will enter into a preliminary agreement with the inventor. This provides for the manufacturer to prosecute the patents in the inventor's name with the right to an exclusive license paying specified royalties, if and when the patent issues. This will relieve the inventor and the gas company of considerable expense and often provides a better patent which, of course, remains the property of the inventor.

Provision is normally made for the cancellation of the agreement if the manufacturer decides not to market the product, in which case the patent is still owned by the inventor at no cost to him. This might occur if studies indicated unfavorable commercial possibilities or if it were impossible to obtain a patent that provided a substantial monopoly on the idea. Unfortunately, unpatentable ideas have little or no commercial value regardless of their practical value. Cooperation between the manufacturer and the inventor in developing the product and prosecuting the patent does much to evaluate the idea in the minds of all parties concerned and, therefore, is an aid to a better understanding.

A manufacturer will attempt to develop a product that will reach as large a market as possible and not one just to meet local conditions. This may and often does result in the gas company being able to buy a better product at a lower price, as well as royalty free.

On the whole it seems gas companies could use manufacturers to better advantage by consulting with them relatively early about their problems. Such a practice would be advantageous to all concerned.

Manufacturers supplying products to the gas industry will be successful only to the extent that they solve or help solve the problems of the gas industry.

Acknowledgment

This article adapted from a presentation made at the Southern Gas Association annual meeting, Dallas, Texas, April 1958.

* * *

FIG. 1. **Electric typewriter type bar,** a 4⅝ in. by 9/32 in. stamping of 0.040-in. thick type 1040 steel, requires austempering to produce hardness and toughness necessary for long life and reliable operation.

Automatic Austempering Unit Speeds Electric Typewriter Parts Production

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AN INTEGRATED, MULTIPLE-STAGE HEAT-PROCESSING MACHINE at the International Business Machines Corporation plant at Kingston, New York, austempers electric typewriter type bars to uniform metallurgical characteristics and close dimensional accuracy at high production rates and without rejects. Designed and built by Selas Corporation of America, this automatic machine has reduced manpower requirements 40 percent and materially reduced non-productive downtime.

The heat processing machine, furthermore, forms a logical segment of the work flow. It is located, not in a separate heat-treating shop, but in the metal-working area close to the press that stamps out the workpiece. Parts handling is simplified accordingly.

Efficient heating with minimum heat loss to the surrounding area makes this arrangement possible. This high thermal efficiency is indicated by the fact that the high temperature section of the machine is mounted directly on a hardwood floor.

The parts treated are type bars, such as that pictured in Fig. 1, for IBM electric typewriters. The type face is subsequently soldered to this type bar, thereby forming the lever that actually strikes the ribbon, and produces the impression on the paper.

High operating speed of electric typewriter type bars requires a hard, tough structure and a flat shank. These requirements are embodied in the specification of hardness **Rc 42-44, shank flat ± .001 in.**

The type bar is about 4⅝-in. long, 9/32-in. wide, and 0.040-in. thick, stamped from AISI 1040 steel and bent at one end. Since all the type bars in a typewriter form a segment of a circle when at rest, but each must strike the paper in a vertical position, the bar is press-formed to a different angle for each character. At least 42 such shapes are required for each typewriter.

Required hardness and flatness are developed by heating the parts for hardening, and quenching them in an elevated temperature bath to permit an isothermal transformation to take place; this process is known as austempering. Fig. 2 demonstrates the isothermal transformation of this AISI 1040 steel.

The process itself is not new. Type bars were formerly treated at about the current production rate, using two salt bath furnaces — one for high temperature austenitizing and the second for isothermal quench. This equipment required five men for operation, and involved considerable maintenance time, expensive fixture replacement, and large quantities of salt plus other supplies.

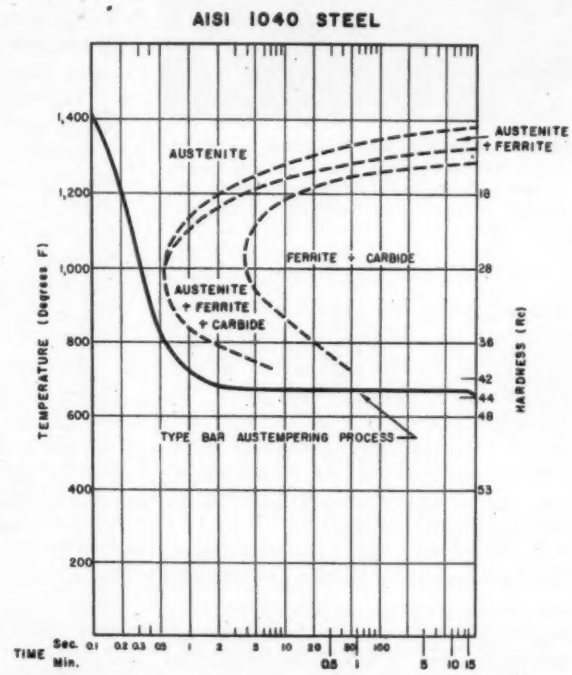


FIG. 2. **Isothermal transformation curves** for AISI 1040 steel. Solid line indicates heat treating process applied to type bars.

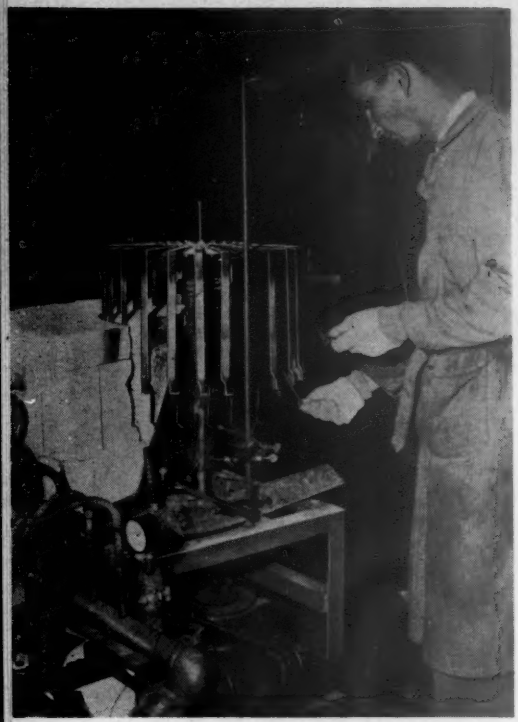


FIG. 3. **Process development engineer** checks heat treatment cycle in Selas laboratory, using experimental conveyorized furnace capable of producing hundreds of IBM bars per hour.

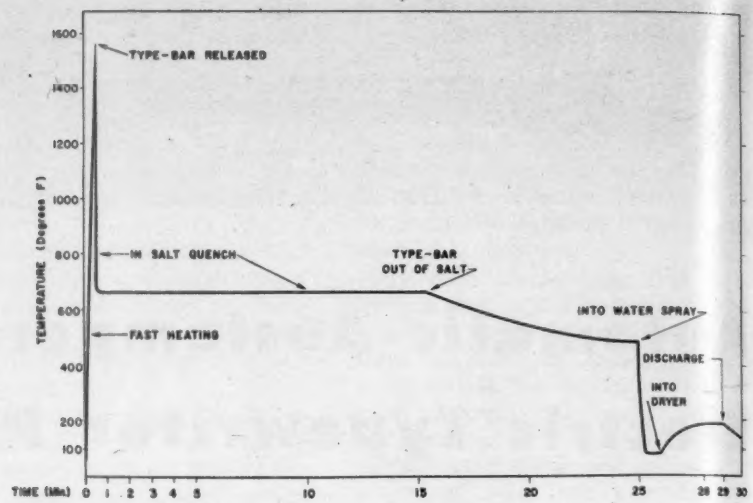


FIG. 4. **Gradiation hardening** and cleaning process was expressed as a time-temperature curve in development of processing unit.

Automation Desired

When IBM moved its typewriter manufacturing operation to a new plant near Kingston, New York, the company determined to increase efficiency by automating processes wherever practical. Type-bar austempering was one of the processes selected for increased mechanization.

In developing the new equipment, IBM production engineering personnel and Selas process development engineers critically examined the austempering process. It was determined that a fixed time of treatment was required only in the isothermal quench and that the initial heating and subsequent cleaning operations could be shortened without adversely affecting the quality of the workpiece.

It was therefore decided that the type bar should be initially raised above the austenitizing temperature by passage through a furnace operating at a high temperature gradient, quenched by quick, direct transfer — without coming into contact with room air — into a conveyorized salt bath maintained at the proper temperature, and then washed to remove the salt. Bars were to be delivered completely treated, clean, dry, and at room temperature.

New Machine Developed

The process was resolved into a basic time-temperature cycle in the Selas laboratory, using the simplified furnace shown in Fig. 3, and carefully checked by a pilot run of several thousand bars.

The time-temperature curve (Fig. 4) developed as a result of the intensive laboratory investigation was then used to produce an integrated equipment design. The basic concept of the heat processing machine, with high temperature gas furnace, mechanized salt bath quench and high speed automatic wash and dry sections, is shown in Fig. 5.

The heat processing machine, fabricated at the Selas plant in Dresher, Pennsylvania, has been in operation at Kingston for almost a year, and has proved so successful, that a similar unit for heat treating cam levers is now under construction.

The type-bar unit takes little floor space in the IBM plant, being 25-ft, 4-in. long, 8-ft, 6-in. wide and 5-ft, 2-in. above floor as installed in a 2-ft, 4-in. deep pit. Bars are loaded 3-ft, 5-in. above the floor line; delivered 1-ft, 7-in. above floor line to conform to IBM's present stock-handling procedures.

Temperature and electrical controls are centralized in a cubicle 6-ft wide by 6-ft, 8-in. high by 2-ft, 9-in. deep. Fuel carburetion and safety equipment occupies another cubicle 8-ft wide by 7-ft high by 2-ft, 9-in. deep, with all instruments and controls accessible from the front panel.

Automatic Handling

Handling is completely automatic after manual loading of the type bars onto the support fixture of the high heat conveyor shown in Fig. 6. This conveyor is a horizontal pinwheel equipped with heat resistant chrome nickel alloy fixtures. One type bar is loaded in the vertical position at the extreme end of each radial pin and is

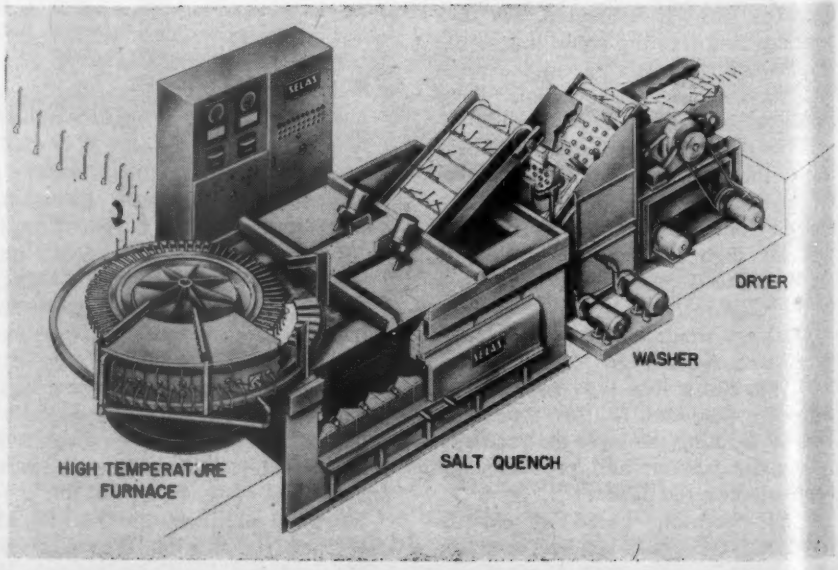


FIG. 5. **Diagramatic** representation of integrated type bar heat-processing unit developed by Selas Corporation of America for use by IBM Electric Typewriter Division.

FIG. 6. **IBM workers** load type bars at high temperature furnace of Selas heat-processing machine. Salt quench, at left, is completely covered and shielded for workers' protection.

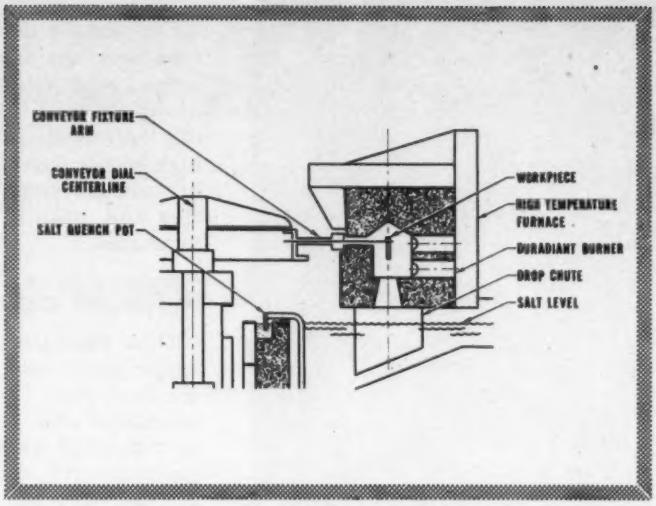


FIG. 7. **Direct exposure** of each type-bar to heat from patterned Duradiant gas burners establishes uniform hardening temperature. Type-bar is then released directly into salt quench bath.

carried from the loading area into the high temperature furnace.

This furnace is shaped to conform to an arc of the circle through which the type bars travel. Each type bar is heated to 1550 F in 25 sec., then is released from the fixture to drop through a tube from the floor of the furnace into the salt bath, as shown in Fig. 7.

The high temperature furnace is fired by Duradiant burners set in the outer refractory wall. Each burner consists of a ceramic cup in which a controlled mixture of natural gas and air is burned. The flame wipes the cup, bringing it to incandescence, resulting in high intensity radiation of thermal energy to the workpiece. Combustion is virtually completed within the cup, preventing flame impingement on the workpiece although the burners fire directly at the type bars at a distance of only four inches. Burners are placed in horizontal rows in a pattern engineered to produce a uniform temperature throughout the type bar by the time it is released for quenching.

This principle of furnace construction and operation, known as *Gradiation*, offers several operating advantages. Three factors in combination protect the surface of the workpiece:

1. Controlled combustion of a rich gas-air mixture to produce a slightly reducing atmosphere,
2. Tight furnace construction plus positive furnace pressure to prevent infiltration of excess air, and
3. Total time of workpiece exposure to the heat measured in seconds.

Fast start-up permits shutting down the furnace over holidays, while low fuel consumption in combination with 20-min recovery time makes idling of furnace, as in the 10:30 p.m. to 6:30 a.m. portion of Fig. 8, an economical overnight procedure. Fig. 8 also shows the close furnace temperature control made possible by Gradiation design.

Salt Quench Furnace

The salt quench furnace, into which the type bar is dropped after reaching 1550 F, is the largest component of the austempering line. Like the other parts, it was fabricated complete and shipped fully piped and wired, with all refractory in place and all equipment assembled, ready to be set in place and requiring only hook-up of power, fuel mixture, and control lines. It is shown prior to shipment in Fig. 9.

The salt quench bath is contained in a welded steel pot set into a specially designed furnace. The salt pot is com-

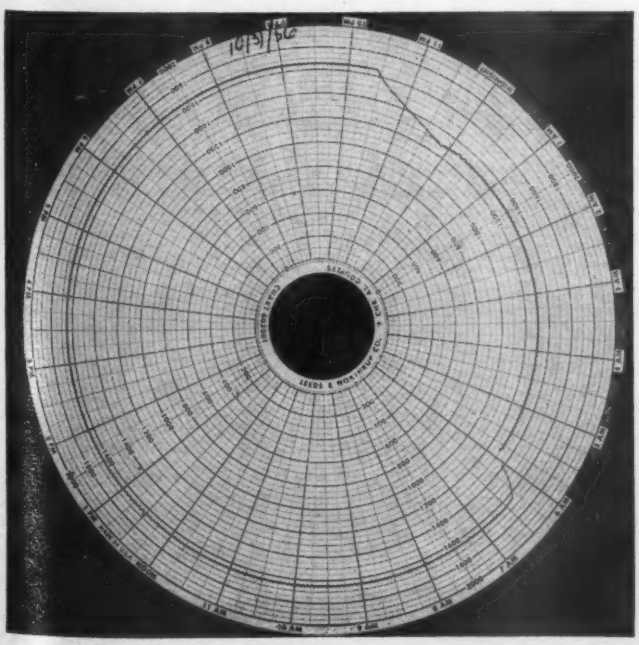


FIG. 8. **Twenty-four hours** of operation of the high temperature furnace. Idling furnace was brought to operating temperature in 20 minutes, operated at 1650 F for 16 hours 5 minutes, idled for the rest of the night. Record shows little variation in temperature despite operation with full load during some periods, partial or no load during others.

FIG. 9. **Salt quench furnace** is inspected in Selas plant prior to shipment to IBM.

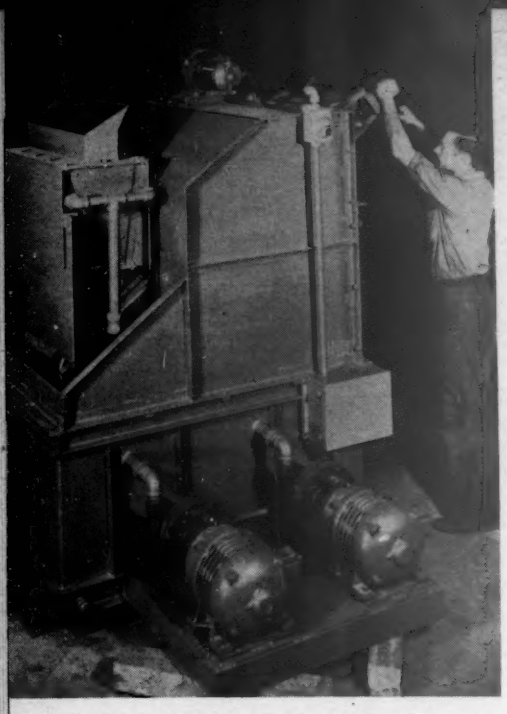


FIG. 10. **Making final adjustment** on type bar washer prior to shipment. Salt is washed off by water spray while type bar falls through chute at left onto flight conveyor. Recirculation conserves wash water.

pletely enclosed to prevent dangerous splash of hot salt, and to minimize heat loss. Heat is supplied by two rows of Duradiant burners firing at close range, one row on either side of the pot. Twin propeller-type agitators provide temperature uniformity within 2 F throughout the salt bath. Salt temperature is automatically controlled by regulation of the fuel mixture pressure in the burner manifolds.

The type bar is held in the salt bath for 15 minutes, spending about 10 additional minutes on the salt quench conveyor. It then falls through the recirculating water spray shown in Fig. 10 to clean off the dried salt, and is carried up a belt-type conveyor and deposited into a dryer.

The dryer employs circulating warm air to remove the moisture from the type bars, the air heated by a spark ignited Selas direct flame gas burner. The dryer is unusually compact for this operation, measuring only 56-in. high by less than 55-in. long. The type bars are delivered (Fig. 11) clean, dry, flat and uniformly hardened and toughened.

Automatic Operation

Once the furnace is lighted and at temperature, and except for loading the type bars, the operation is fully automatic. Fuel gas is mixed with air in controlled proportions by a Selas gas combustion controller. This device incorporates a sleeve type mixing valve which holds the present fuel:air ratio despite large variations in demand. An integrally mounted compressor pressurizes the fuel mixture for delivery to the burners. Mixer is panel mounted with valves, gas and air Flo-Scopes, and safety equipment on a panel located close to the heat processing machine.

Also close to the heat processing machine is a motor and temperature control center (Fig. 12). A thermocouple in the high temperature furnace chamber controls the initial heating. The chart in Fig. 8 is from this recording controller, which supplies a signal to a motorized valve modulating the gas-air input rate to the burners. A similar recording controller indicator, serviced by a submerged thermocouple, controls the temperature of the salt quench.

As an additional safety feature, another indicating controller is operated from a separate thermocouple in the salt quench furnace to prevent overheating under unusual or abnormal conditions. The temperature control system is completed by an indicating controller which regulates the temperature of the circulating air in the dryer.

Salt bath burners and dryer burner are spark ignited from the control panel through an automatic purge cycle control, which eliminates the hazard of possible flammable vapor accumulation. All the motors in the heat processing system are started and stopped from a cluster of push-buttons close to the temperature controls, with pilot-light indicators to monitor operation.

The motors include the combustion controller, two water pumps, the furnace, salt, wash and dryer conveyors, the salt mixes, and the dryer blower.

Metallurgically, the heat treatment could be used as a text book illustration. The type bars as received reveal under the microscope a thoroughly spheriodized structure. After treatment, micro examination revealed a tough, fine-grained Bainite.

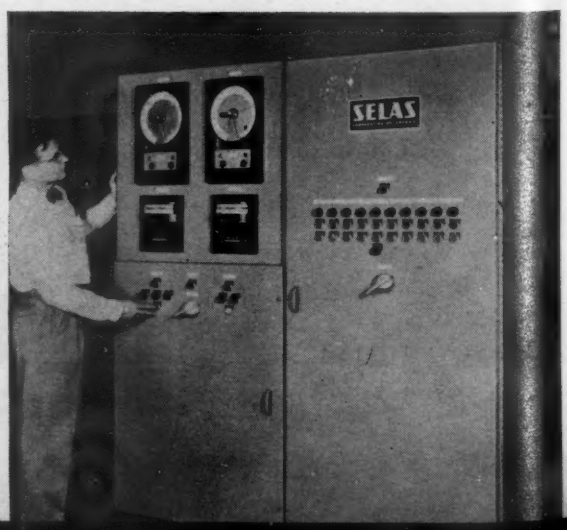
Very Satisfactory Results

Results of this operation have been highly satisfactory. The heat processing machine is operated by three men instead of the five formerly required for the same production. Dragout of molten salt is substantially reduced while a possible personnel hazard in periodic removal of sludge from the hot salt has been eliminated completely. Downtime has been materially reduced.

This has been accomplished, furthermore, with a reduction in the reject rate, and with virtual elimination of scrap. And, by employing a machine-tool type of heat processing equipment, IBM has moved its austempering from a separate heat treat room to the type bar production area, materially reducing the amount of work handling required. * * *

FIG. 11. **Heat treated,** washed and dried type bars emerge from Selas heat processing machine into tote box at IBM electric typewriter plant. Compactness of unit is demonstrated here. Temperature and motor controls are in cubicle behind flue at left; combustion controls and associated equipment are in cubicle facing camera at rear of aisle at right. Presses and other metal-working tools surround the heat processing machine.

FIG. 12. **Temperature and motor control cubicle.** Temperature and burner ignition controls are grouped at left; motor switches are in line at right. Use of two disconnect switches, one for control and the other for motor circuits, simplifies electrical maintenance.



Power Supply and Space Requirements for Mobile Radio Communications

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MOBILE RADIO EQUIPMENT used in vehicles depends upon all the components of the generating power supply of the vehicle for its power supply. Any user who fails to make a careful analysis of the proper power supply to be furnished with vehicle, or neglects to properly install and maintain the generator, regulator, battery and wiring will seriously restrict the operating efficiency of the radio, and possibly introduce additional maintenance problems. This may even extend to increased costs of the radio and vehicle operation.

These increased costs may result from shortened battery life, insufficient light from headlights, or burning out of lights, coils, burned ignition points, shortened life of radio tubes and vibrator. Additional costs may result from lost man hours of productive work when the battery fails thus making it impossible to move the vehicle.

Users of mobile radio communication equipment may find the following suggestions advantageous in installation and maintenance of various components:

Fuse Block and Battery Connections

1. Main power connection to be made preferably to starter post.
2. Assure good electrical connection between radio equipment and battery (remove corrosion and rust at all connections periodically).
3. Mount fuse block on engine side of fire wall in a location permitting use of a short cable, as free as possible from damage through abrasion or heat. Keep cables as far away as possible from ignition system.
4. Accessibility for maintenance.
5. Protect from physical damage and weather.
6. Ease, economy, and neatness of installation.

Power and Control Cable

1. Ease, economy, and neatness of installation.
2. Provide proper support and protection from abrasion and heat.
3. Provide sufficient slack for servicing equipment.
4. Complete length of cable as furnished by radio manufacturer should be installed. Any excess cable should be coiled, wrapped, and stored in a convenient location *other* than engine compartment.

Electrical Supply

Electrical system of a motor vehicle normally requires some modification when mobile radio equipment is installed. When high power radio equipment is installed which of necessity has a high battery drain, it is necessary to install a special generator and associated parts to supply the required charging current for the battery. In most cases, it will be necessary also to do some ignition noise suppression on the vehicle. Most radio manufacturers include ignition suppression kits with their equipment with instructions for installation.

Noise Suppression of Vehicle Electrical System

1. High tension lead from coil to distributor should be held to a maximum 8-in. length.
2. A coaxial type capacitor is the most effective type capacitor for suppressing noise generated by d-c generator brushes, voltage regulator contact points, and ignition noise from the coil. Principle behind use of coaxial capacitors for this purpose is to reduce the inductive effect present in the long lead furnished on the standard type of capacitor. For example, a Sprague Electric Hi-Pass 48P-18, rated at 0.5 mfd 50-v d-c or equivalent should be used on the generator. Similar coaxial capacitors are used on the voltage regulator (one on battery terminal and one on armature terminal, i.e., Sprague 48P18) and ignition coil but of a different rating. The coaxial capacitor should be connected to the battery terminal of the ignition coil.
3. All rods, metal tubing, and conducting tubing (such as coolant lines) and wiring, other than ignition, should be kept well away from the ignition system.
4. A coaxial terminal connector at the end of base mount of the antenna and a UHF Series 83 connector plug on the antenna transmission line to the radio unit will reduce any noise radiated from electrical equipment located inside the cab when the antenna is mounted on the cab.

Periodic Maintenance of Electrical System

Normal periodic inspection of the vehicle electrical system becomes more important with installation of mobile radio equipment, and it is recommended that the frequency of inspection be increased and cover these items:

1. Battery condition—check under load with engine off and with engine operating to produce full charging rate.
2. Check battery level and any unusual water consumption.
3. Examine and if necessary, clean and tighten battery post and ground connections.
4. Check fan belt adjustment and wear.
5. Check generator brushes and wear.
6. Check regulator performance with suitable instruments according to manufacturer's service procedures.

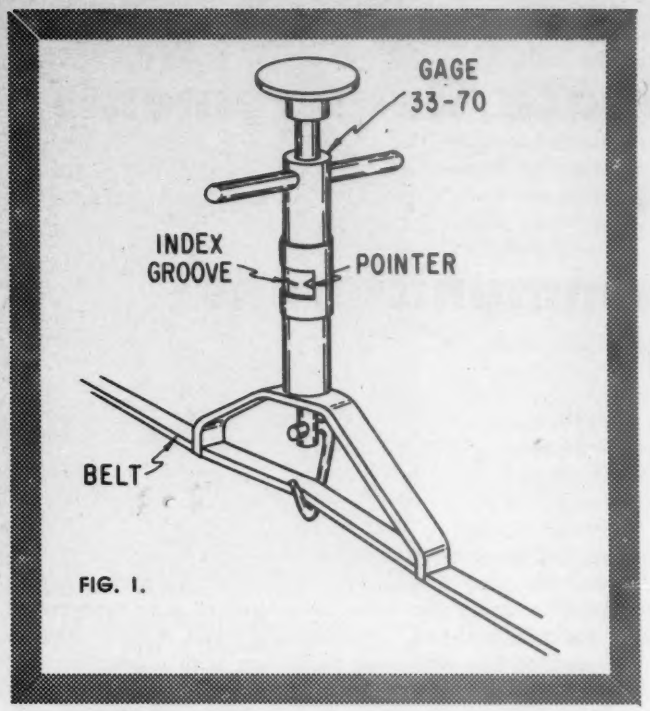


FIG. 1.

7. Examine connectors on both ends of the high tension cables connecting the distributor tower to the spark plugs and the high tension conductor connections from the distributor to the coil. Look for burns, dirty connections, and corrosion. Good cleaning of these connections including the female end in the distributor tower is mandatory for reducing radio interference and increasing engine performance.

Generator Belt Drives

Installation of higher capacity generators presents special problems because of their size and horsepower requirements. Among factors to be considered in present and future designs are:

1. Belt wrap on generator pulley—minimum wrap leads to slippage.
2. Size and type of belt.
3. Whether generator is mounted on tight side or slack side of the fan belt.
4. Bearing loads imposed on the generator due to belt geometry and belt tension.
5. Need for multi-drive or supplementary belts.
6. Space for a large generator or an alternator.

Belt Adjustment for Generator Drive

Many users complain of their inability to obtain and maintain proper belt adjustment on high charge generators, power steering units, and air conditioning compressor drives.

On those systems which have been properly designed to match the load and belt drive to the drive, belt slippage results from too much slack in the belt. The result is insufficient output from the generator; excessive belt wear; glazed surface on the belt, and a squealing noise which is produced from the belt slipping on the pulleys when the engine is accelerated. Too tight belt tension causes abnormal wear to the generator bearings and the bearings of other components on the belt drive as well as excessive belt wear.

Two methods which are workable but which are either too bothersome to the mechanic because the equipment is awkward to use, or not exact enough to obtain the proper tension are:

1. Use a straight edge and lay it on the outside edge of the belt midway between the fan pulley and the generator pulley. Check with ruler the deflection at midpoint of the straight edge when a ruler is pressed downward on the outside of the belt. This should be ½-in. measured to the bottom of the straight edge. Move the generator inward or outward from the engine on the base mounting to obtain this measurement.
2. Second method is to adjust belt tension to a point where the generator pulley will not slip within the belt while pulling on the ventilating fan fin with the forefinger.

A recently recommended superior method that is exact, simple to perform, and convenient to use is to utilize a gage of the type illustrated in Fig. 1. This gage No. 33-70 is for use in adjusting belt tension on 1957 Oldsmobiles. This same tool is used to check belt tension for the generator, fan, and water pump, power steering, and compressor for the air conditioning system. It will in some cases be necessary to establish a new index line on the tool for the particular belt drive.

As shown, the U-shaped bar is positioned on the top side of the belt at approximately midway along the straight line section of the belt. Apply tension to the belt before loosening the generator adjustment bar in order to retain the seating of the belt in the pulley grooves. Following this precaution, loosen generator adjustment arm and fasten gage hook under the belt and move generator to tighten or loosen the belt so that the pointers on the gage index with the index groove. Finally, tighten the generator adjustment arm.

When installing a new belt because of replacement due to wear or on a new installation, the tension should be re-adjusted to take up the initial stretch after a 15 minute run-in period. This will minimize slippage and improve life of the belt.

Generators

Regular production generators are unsuitable for vehicles equipped with mobile radios. Generators with proper characteristics usually can be obtained as a production option when mobile radio is intended to be used on the vehicle. These special generators can also be purchased as replacement of existing generators when radios are added to vehicles already in service.

In either case, however, before purchasing the special generator, it will be necessary to determine as accurately as possible, the speed, mileage, and operating hours, and the total electrical load of a vehicle to be equipped. With these factors known, it will be possible to obtain a generator that will fit into the available space; will allow for suitable pulley and driving belt installation, and will have correct cut-in and output characteristics to provide satisfactory vehicle and radio operation.

Voltage Regulator

While most regulators are factory adjusted within limits that have been established by many years of experience, on any particular application the vehicle manufacturer may recommend limits that differ slightly from normal settings in order to obtain power operation for that case. It is important that, for service operation in the field, limits and service procedures recommended by vehicle manufacturer be followed if adjustment is required.

Voltage regulator re-adjustment is required under the following conditions:

1. When specific gravity is low (under ⅔ charge) on a battery that is on a vehicle that has been operated for such a period at light load that no further charge is being put into the battery. Under this condition, regulated voltage is probably low and should be increased.

2. When a fully charged battery is being charged at a high rate (above 8-amp with no extra load such as radio equipment). A low scale meter, like a test instrument should be used for this check. Under this condition, regulated voltage is probably high and should be decreased.

Ammeters

There is much to be said in favor of installing ammeters on radio equipped vehicles and instructing drivers how to interpret the reading for the good performance of the vehicle as well as the radio.

Ammeters can be used to indicate an overcharge condition to the battery, (which will, while the engine is running, tend to shorten the life of tubes and vibrators of the radio equipment). Ammeters also give the driver an indication of a low charge rate which may show need for adjustment.

Space Requirements

Equipment consists of following units:

1. **Transmitter-receiver and power supply.**
2. **Antenna with base mounting.**
3. **Control unit.**
4. **Microphone or handset with switch hook where necessary.**
5. **Loud speaker.**
6. **Cables.**
7. **Fuse block.**
8. **Selective calling unit when used.**

Transmitter-Receiver and Power Supply

These units are not standardized as to size or weight and vary from a minimum to a maximum as shown below.

	Height	Width	Depth (incl. handle)	Weight
Minimum	5½ in.	9½ in.	20 in.	30 lb.
Maximum	6 in.	20 in.	20 in.	85 lb.

In addition to these measurements, allowance must be made for one or more cable connector plugs which extend beyond the case 4-in. Consideration should be given to a minimum bending radius of 4-in. for the cable, plus allowance for disconnecting the connector plugs.

A large portion of the equipment manufactured today is of the drawer type and when these are installed, provision should be made to withdraw this unit slightly so the top can be removed. The equipment must be kept locked to meet all FCC requirements so that only authorized licensed personnel will have access to the equipment.

Space limitations are especially severe on tractor-trailer units. The only place the radio unit can be mounted is in a weatherproof cabinet on top of the cab. Most cab-over-engine jobs have a shelf in back of the driver's seat which may be conveniently utilized for mounting the radio unit.

It is important that a space be selected in one of the compartments provided on utility vehicles for mounting the radio. When ordering new vehicles, dimensions of a suitable compartment should be specified for a radio unit. This compartment should be in the forward end of the body on the left side.

Antenna and Base Mount

For the equipment operating in the 150-mc and 450-mc bands, where the antenna is approximately 18 and 6-in. respectively, the proper place to locate the antenna is in the center of the vehicle roof. The roof thus provides the necessary ground plane for good operation. A coaxial type bumper mount is also available but tends to pick up more noise unless proper bonding is provided between the bumper and chassis of the vehicle.

In general, the antenna associated with the 25 to 50-mc equipment is mounted on rear quarter panel of a passenger car or on the top or side of the cab, truck, or bus. When mounted on the top of a cab of a truck, a convenient spot is directly in back of the driver. When placed here, it should be located to preclude possible contact with overhead trolley wires or low hanging high voltage conductors. Special care should be taken to obtain a good clean ground connection on the inside surface of the body by removing any paint from the body surface and tightening the ground firmly to the body.

Control Unit

Control unit must be located where it is conveniently accessible and clearly visible to the user. It is suggested that this unit be located beneath the instrument panel and in the center so that the control unit is flush with the front of the instrument panel. When in this position all controls and indicating lamps are within reach and vision of the driver and others in the vehicle. Control units have a typical dimension of 3¾-in. high by 6-in. wide by 4-in. deep.

Microphone or Handset

Either of these units should be located within reach of the driver and other occupants of the front seat of the vehicle. Common location is in the center of the instrument panel but below the top edge. Care must be taken to keep microphone or handset and its connecting cord from interfering with proper operation of shift levers, brake handles, and foot pedals.

Loud Speaker

Speaker may be located on the driving compartment side of the fire wall, behind the instrument panel utilizing the entertainment radio grill, above the windshield, or in back of the driver in a cab installation at a point about ear level. Typical dimensions of a speaker are a maximum of 5½-in. high by 5½-in. wide by 3½-in. deep.

Cables

No provision is generally made for radio and power supply cables.

In passenger cars, the cable may be run from the trunk to the engine and driving compartment through the inside of the car underneath the carpet near the propeller shaft tunnel.

If it is believed that this is insufficient protection, a "wire mold," a pancake No. 2600 type over-the-floor molding, can be utilized. This can be installed either near the door sills or in the center near the propeller shaft tunnel. Two sections of this will be necessary, one for the power cable and the other for the control cables to the control head. Locate power cable section on the driver's side and the control head cable section on the right side.

The "wire mold" pancake type over-the-floor conduit can be conveniently used in cab installations on trucks that have a separate body, and then connect the cab to the radio compartment in the forward section of the body with a short piece of flexible metal tubing.

Typical cable lengths are from a minimum of 18 ft to a maximum of 20 ft.

Fuse Block

This unit should be located on the fire wall on the engine side and utilize as short as possible a cable connection to the starter post and endeavor to route this to keep it free from damage from abrasion and heat.

Selective Calling Unit

In some cases this unit is a separate unit and provision for its location and its connecting cables in the radio compartment, should be provided.

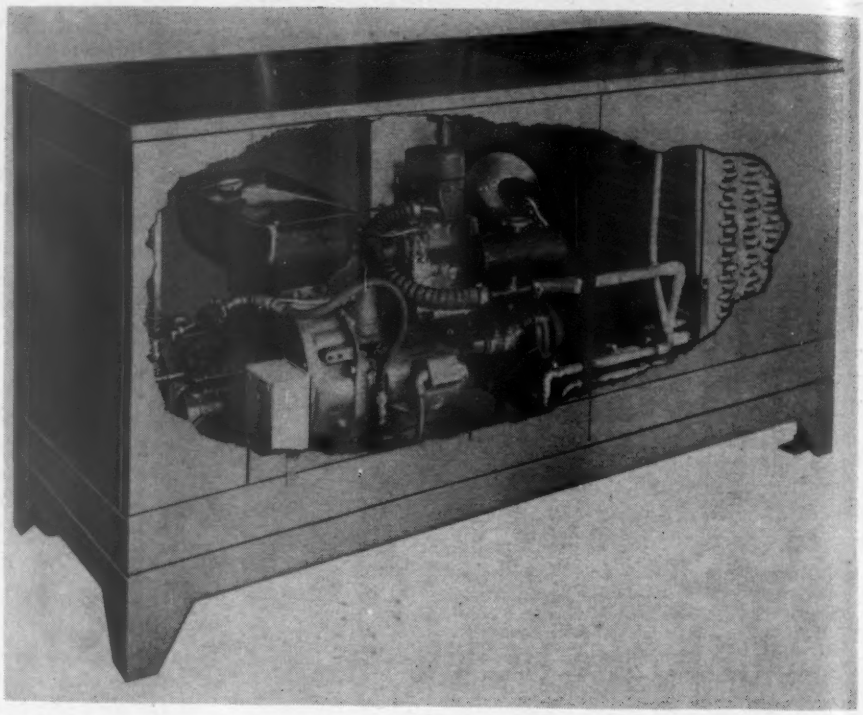
Acknowledgment

This article prepared from a presentation made at the AGA Operating Section Conference, New York City, May 1958.

* * *

Comfortemp Introduces Gas-Engine Driven Air-Conditioning Unit

NEWEST GAS-FUELED AIR CONDITIONING UNIT added to the industry's growing line of equipment is the Comfortemp "add-on" unit, available in both 3 and 5-ton capacities. Designed for outdoor installation and taking up no interior space, the Comfortemp unit is suitable for both residential and commercial use. It is adaptable to both new construction and existing buildings and can be used with existing duct work. The new gas-fired unit is a product of the Comfortemp Division of Comfort Products, Inc., Dallas, Texas.



Cutaway view of new Comfortemp unit shows how equipment is mounted in the acoustically treated cabinet for outdoor installation. Cooling coil is located inside, as "add-on" unit for either existing or new gas-fired central heating systems, and can use existing duct work. Insulated lines carry refrigerant from unit to coil.

How It Works

The Comfortemp unit uses a refrigerant compression system. A gas-fueled liquid-cooled, internal combustion engine is used to drive a four-cylinder V-type standard compressor. The two are coupled by a dry type clutch operating on the centrifugal principle and designed to engage only when the engine has attained a predetermined speed. The action is modulated. Reduction in starting torque permits use of an engine of less horsepower and of smaller physical size. An automatic lubricating device maintains oil at constant level in the crankcase, and servicing is needed only once each season.

In the Comfortemp units the engine, compressor, and evaporative condenser are all contained in an acoustically treated cabinet for outdoor installation. No cooling tower is required. A patented advance type, evaporative condenser combines water spray and forced air to effect rapid heat transfer. The special turbulator wheel produces a heavy mist, as well as a washing action on the coil to minimize scaling and maintain high efficiency.

Controls

Standard thermostatic controls make the Comfortemp unit completely automatic in maintaining the desired temperature. Cooling output can be varied to provide correct balance for any requirement.

Installation

Installation in any new, or existing duct system is quite simple. No high-voltage wiring required. The Comfortemp unit is quiet in operation. Installations of similar units have been made directly outside churches, hospitals, and homes, and have proved quieter than many other types of equipment. Experience has shown that the Comfortemp unit can operate for as little as one-third the cost of conventional electric units of comparable capacity.

The Comfortemp Division has pledged that its output and expansion will keep pace with the market. Initial merchandising and distribution will be through gas utilities. In areas where the gas utility does not merchandise the product, utility-approved dealers will be appointed.

Established Firm

Comfort Products, Inc., established in Illinois in 1938 and moved to Dallas in 1945, has previously engaged in producing evaporative coolers along with contract work for General Electric, Sears-Roebuck, and the U. S. Navy. In late 1957 a group of Dallas businessmen purchased control of the company, and shortly thereafter the possibility of manufacturing gas-driven air conditioning equipment received their consideration.

In reaching a decision to undertake this project, encouragement and information received from representatives of the gas industry in Dallas played a substantial part. On the drafting board and in subsequent stages, data and constructive suggestions from members of the Southern Gas Association and the American Gas Association proved of great value.

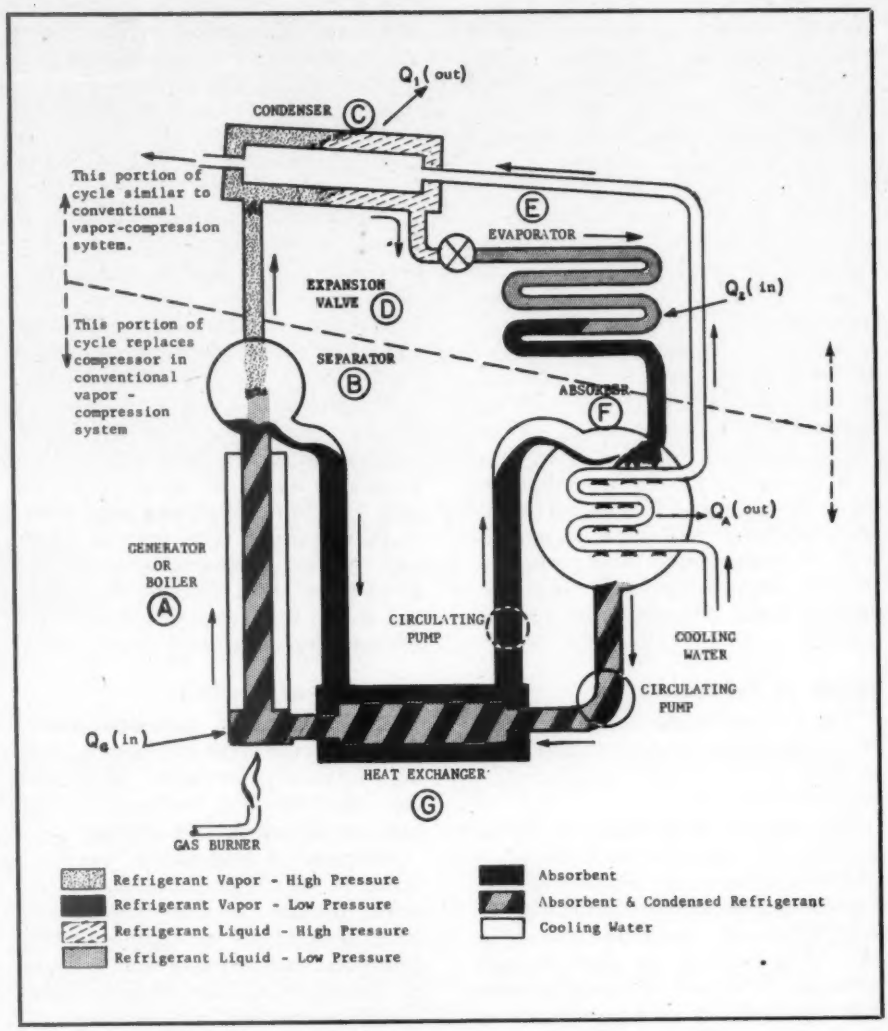
Field tests of previously produced units operating on the same principle were studied together with means of improvement and modernization. From this and with the benefit of gas industry assistance, the Comfortemp unit has resulted. * * *

Typical Absorption Cycle

The absorption cycle, which differs from the conventional vapor compression cycle only with respect to the method of compression, employs the ability of a chemical solution or a pure chemical to absorb a refrigerant at low temperatures and to give up that refrigerant at high temperatures.

A typical absorption cycle operates as follows (refer to schematic drawing):

1. At **A**, the gas burner heats the solution in the generator and drives off the refrigerant.
2. At **B**, the absorbent separates from the refrigerant vapor and passes back to the absorber.
3. The high-pressure refrigerant vapor passes into the condenser **C**, in which cooling water, usually maintained at a relatively low temperature by means of a cooling tower, condenses the refrigerant.
4. The condensed high-pressure refrigerant flows through the expansion valve **D** and into the evaporator **E**, where it evaporates and cools the air passing over the coils into the house.



EDITOR'S NOTE: This is the first of several "data sheets" describing the refrigeration cycles of various types of gas-fueled air conditioning equipment now available or being studied for future application. While the data sheets do not apply to any specific equipment, they do provide basic information on the many different cycles now existent. In general, the series of data sheets will discuss most of the equipment mentioned in the table on AGA air-conditioning research studies by Robert B. Smith that appeared on page 22 of the June 1958 issue of AMERICAN GAS JOURNAL.

5. The evaporated refrigerant passes into the absorber **F**, where it comes into contact with and goes into solution with the absorbent. Cooling water passing through the absorber removes the heat of absorption given up by the refrigerant as it goes into solution.
6. The solution of absorbent and refrigerant then flows through a heat exchanger **G**, and returns to the generator **A**, at which point the cycle is begun again.

Heat Balance

Q_g (in) Heat added to the system by the gas flame to vaporize the refrigerant.

Q_1 (out) Heat of condensation of the refrigerant in the condenser.

Q_2 (in) Heat of vaporization of the refrigerant in the evaporator.

Q_a (out) Heat of solution (chemical effect) and heat of condensation of the refrigerant.

For this cycle, the heat balance equation may be shown as follows:

$$\underset{(in)}{Q_g} + \underset{(in)}{Q_2} - \underset{(out)}{Q_1} - \underset{(out)}{Q_a} = O$$

* * *

Corrosion Considerations in System Design

S. Clifford Jones, *Corrosion Control Engineer*
Cincinnati Gas & Electric Company, Cincinnati, Ohio

IN THE DESIGN OF A DISTRIBUTION SYSTEM, there are a variety of solutions for almost every situation. Few of us would agree in every detail on any given problem. The thoughts expressed in this article are my own. They do not necessarily represent the operating practice of The Cincinnati Gas & Electric Company.

There are, of course, many considerations other than corrosion in the design of a distribution system. Some of these may, on occasion, influence corrosion control design. Use of steel pipe in a cast iron system is often dictated by the pressure at which the line is to be operated. We will review only the factors which influence design for corrosion control.

In design, we weigh the possible and probable types and severity of corrosion. We study the methods of control. We compromise these considerations to create a plant that can be operated at the least cost per year of service.

Types of Corrosion

The types of corrosion encountered in gas distribution systems include electrolysis, galvanic cell, concentration cell, and bacterial.

The term **electrolysis** is usually reserved to designate corrosion caused by electric currents from a power source. Various groups are investigating the possibilities of corrosion attack by alternating currents, but generally such corrosion is caused by direct currents only. Examples of such power sources are street and electric railway operations and rectifiers.

A **galvanic cell** is created by placing two dissimilar metals in an electrolyte. Earth is an electrolyte. When we place two dissimilar metals in moist earth with a metallic connection between them, we create such a cell or battery. All earth does not have equal properties as an electrolyte. The more active the earth is as an electrolyte, the more current will flow and the corrosion attack will be faster. Likewise, the greater the potential difference between metals, the greater the current flow will be.

A **concentration cell** is formed when a metal passes through areas of unequal electrolyte. This can be caused by natural soil changes or by the addition of chemicals, such as de-icing salts, at certain locations, or by intermixing strata of earth such as having a clod of top soil in a backfill of clay.

Bacterial corrosion is caused by activity of certain bacteria in the area of the pipe. *I am not sure that all the investigators of this type of corrosion are agreed on the exact mechanics of the attack, except the general agreement that they do not bite the pipe.* There are several definite environment requirements for this type bacteria. They are anerobic, which means that they cannot live in the presence of oxygen. They must have an organic food supply — old root systems, wood blocks, garbage, paper, or gas may suffice. They must have water and sulfates from the soil. They are, therefore, most active in rainy seasons. This type of corrosion was first discovered and identified in swampy areas, but my experience has shown that swampy areas or conditions are not required.

Methods of Control

The methods of corrosion control are selection of material, bonding, coating, insulating, cathodic protection, and inhibitors. All methods are not necessarily used on any one job.

Selection of material is usually a matter of selecting material that is very close together in the electromotive series to avoid any significant potential difference, such as use of steel and copper tubing in metallic contact. Occassionally, a material can be chosen for its resistance to a particular environment. Copper is a poison to the bacteria that are responsible for bacterial corrosion. It is also important to avoid small areas of anodic material in contact with large areas of cathodic material, such as a malleable iron cap or plug in a copper service.

Bonding is a means of providing a low resistance path for the flow of current. We bond a coupling to provide a low resistance path in case the joint becomes an insulated joint. Where the line is picking up electrolysis currents, it is necessary to install a bond to return these currents to their source.

Coatings are used to avoid contact between pipe and earth, to afford a high resistance to pick up of electrolysis currents, and to limit the area of exposed metal where cathodic protection is to be applied. Many good coating materials are available. Selection of a particular coating depends on the particular application, experience, and sometimes on acceptability by workmen. A satisfactory application of the coating is very important.

Insulating joints and insulation are used to break electric circuits. They can be used to separate unlike metals and to separate our lines from other structures. Many insulating fittings, couplings, and flange fittings, are available to separate unlike metals or to break the electrical continuity of the line. Where small clearances between structures are unavoidable, an insulating material inserted in that space will keep the structures from making contact.

Cathodic protection consists of applying an electric current so that the current is always flowing to the pipe. In this case the pipe is always the negative pole or cathode of the circuit. This is done by use of sacrificial anodes or by use of an impressed current. In the first case, an anodic metal is buried and connected to the pipe to form a battery, in which the anode will corrode to protect the pipe. In the latter case, current from a power source, generator, rectifier, etc., is applied through an anode ground bed. These anodes are scrap metal, carbon, or metal alloy.

The use of **inhibitors** in underground service has not been entirely successful. Some substance must be used to hold the inhibitor and prevent its leaching away. Some manufacturers have incorporated inhibitors in the coating material. An inhibitor may form a protective film over the surface to be protected, or if the cause be organic, it may be poisonous to the offending organism.

Determining Control Needs

The application of methods of control must be done in porportion to need and economic advantage. Certain corrosion measurements will indicate needs. Experience with lines in your area also indicate needs. I recall two articles on cathodic protection. One proved that the advantage of cathodic protection in high resistance soil was questionable. The other described the

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Typical is the experience of a utility in a coastal area. For a thorough trial, this company applied TAPECOAT in areas where severe corrosive conditions were known to exist. The lines were dug up this year and, after years of service under severe conditions such as brackish waters and corrosive soil, the pipe showed no signs of corrosion, proving the quality of TAPECOAT protection.

In terms of preventive maintenance and replacement costs, performances like this emphasize the most important consideration in buying protection. Remember, TAPECOAT is a hot-applied coal tar coating in tape form—designed for lasting protection on pipe, pipe joints, service connections, mechanical couplings, fittings, insulated lines, tanks, tie rods, and other steel surfaces vulnerable to corrosion.

TAPECOAT comes in rolls of various widths and is available in asphalt. Where primer is desired, specify TC Primecoat, the compatible coal tar primer.

A TAPECOAT sales and service engineer is always available to help you on any corrosion problem. Write for complete details today!

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installation of cathodic protection on a line through soils of 50,000 to 150,000 ohm per cm. The latter article included a summary of leak data which indicated that the installation was a necessity. We must each decide what is best for our conditions.

Many people feel that design is finished when the job specifications are completed and the blueprints leave the drafting room. On large jobs, the engineers go afield to see that all the provisions are met. In the distribution system, where most construction work is done by our own crews, it is not possible for engineers to be present on all the minor jobs. Design then must provide the instructions, construction methods, and policies for the proper execution of work.

Instruction or training of working forces is tedious and sometimes disappointing. Fellow workmen in our safety departments have demonstrated that it can be done. It must be a continuous program done with the expectation of progression rather than immediate success.

Design Problems

New extensions to a system are, of course, the easiest design problem. The new section can be isolated from the old system with insulating joints and be given every advantage of the latest techniques of corrosion control. Whether that extension be steel or cast iron, certain minimum similarities should be recognized. Every effort should be made to make the installation adaptable to any type of corrosion control that may be desired.

Many of us felt that with the passing of the street railways, our **electrolysis** problem would disappear. The current trend toward use of rectifiers for protection in urban areas may bring the return of this problem. Steel lines are welded, bonded, or otherwise assured electrical continuity. Present cast iron mechanical joint pipe does not provide that assurance.

We had an experience where a housing project installed rectifiers to protect their lines between buildings, without notice to utilities. The water system uses leadite, an insulator, for joints. Our lines were mechanical joint cast iron. All gas and water services were bonded and bond wires were attached from the rectifier. We would feel much more confident of our lines if we were assured of that electrical continuity.

In new areas we can **avoid contacts with other systems.** Avoiding the contact at the time of installation, is not enough. Most companies have some method or inspection service to observe or exert control on contractors or others who make excavations. These inspectors or other personnel must be informed of what we want and be alert to enforce our desires. If such inspection service does not indicate our concern to others, certainly they will not comply.

In new areas, we have the opportunity for **selection of material** of the line and of couplings, sleeves and fittings to be connected to the line. Where unsatisfactory combinations cannot be avoided, they can be isolated. We can control the backfill to obtain a minimum of risk. We can examine our construction practices and methods to be sure that faulty workmanship and bad habits are not creating the flaws to defeat our efforts.

Replacement of sections of main is a more difficult task. We are usually limited in movement from existing locations. Conditions of work are usually more adverse. We must reconnect to the adjoining lines. These factors result in a higher probability of imperfections and, where cathodic protection is employed, will probably result in increased current demands.

Service connections to the main are a problem regardless of material used. There is no generally accepted insulator for use between the fitting and the main. There are a number of insulating fittings for isolating the service from the fittings at the main or at meter connections.

Most service lines are of copper tubing or steel. We have installed copper services, 1¼ and 2-in. sizes, for 25 years. Our experience has been that they not not affect cast iron lines nor large bare steel lines. We have had several instances where we suspect effects of copper services on coated steel lines.

Fittings for several lines are malleable iron, galvanized iron, or brass. We have found, by experience and test, that malleable iron is anodic to all other metals in our system. Such a test of metals in your system may be interesting. It can be done simply by mixing a saturated salt solution in a crock. Samples of materials are then submerged in the solution, and potential and current readings taken. Fresh cut surfaces and inner surfaces of old materials taken from the ground should be sealed with a protective coating.

Where service is installed from a protected steel line, the fitting becomes a part of the line and will receive protection from the line source. In this case, malleable fittings or galvanized fittings could be used with success. They should, of course, be coated to keep the current requirements to a minimum.

The **installation of a service on an unprotected steel line** presents more problems than the effect on fittings. Digging the hole to expose the main creates a concentration cell. If local cathodic protection is added to protect the main, the installation will also protect the fittings. By application of such practices, we reach a point where a minimum of anodic fittings are used without protection.

Steel service lines can be protected from the same cathodic protection sources that are used to protect the main or they can be individually protected by the installation of a small anode. In the first case, the service would be insulated only at the meter connections to isolate the gas system from other underground structures. In the latter case, the service is insulated at the main fittings and at the meter fittings. The anode may be installed at the most convenient location.

Repairs probably present the greatest variety of problems. Repairs are made at points of failure. If that failure is a corrosion failure, we must realize that we are working in an area of active corrosion and creating additional cells. The selection of materials for replacement and application of controls must be done with care. This is especially true where lead or cement joint cast iron lines are under paving. Slight leakage from such lines cannot escape readily because of the paving. Gas is very effective in eliminating oxygen from the soil. The gas is a stimulant too, if not a food for, bacterial growth. With these requirements satisfied, only a minimum of water is required for bacterial activity to proceed.

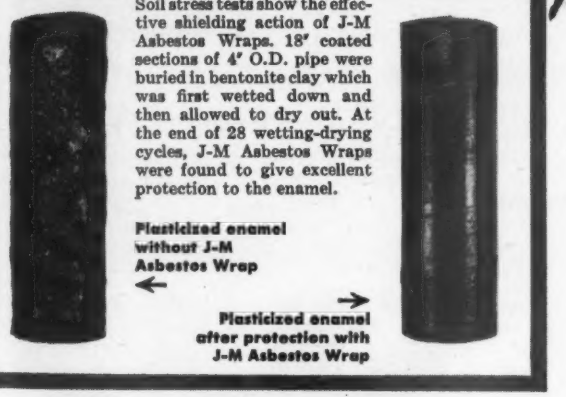
We have had experience with clamps being consumed, bolts eaten from sleeves and saddles, malleable iron saddles or sleeves subject to severe attack, and steel service lines and mains under these conditions severely attacked — in some cases being almost entirely consumed — by bacterial growth. Cast iron shows remarkable resistance to these conditions. The attack on the cast iron line under these conditions is nominal. This has been verified by sand blast operations to prepare joints for clamping. In these days, when higher pressures are being maintained in our older systems, this condition is becoming more prevalent.

You can appreciate that the odd shapes of many of these elements of the system makes it difficult to apply effective protection measures. The protection of a bell joint leak clamp is a good example. The protection should be done entirely with materials that cannot be an aid to corrosion. In the case of bacterial corrosion, these materials should not be of organic nature.

These are, at least, most of the considerations that we have found necessary to weigh in the design of our system. Your system may not be subject to some of the conditions I have described. We must each decide what is best for our conditions. * * *

Stop damage to enamels from earth loads and soil movement...

Johns-Manville Asbestos Wraps are available in 3 types for field application or mill wrapping.



Soil stress tests show the effective shielding action of J-M Asbestos Wraps. 18" coated sections of 4" O.D. pipe were buried in bentonite clay which was first wetted down and then allowed to dry out. At the end of 28 wetting-drying cycles, J-M Asbestos Wraps were found to give excellent protection to the enamel.

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The same research and field tests also demonstrated that J-M Asbestos Wraps provide the strong protection that strong coatings need and deserve. "Asbestos Wraps offer the most effective single protection against damage—prolong the working life of pipeline enamels." Here's why...

Asbestos is an ageless mineral. Fibers of asbestos are strong and tough... cannot rot or decay. As used in J-M Wraps, the fibers are felted, then impregnated with a coal tar or asphalt saturant to form literally a flexible covering of stone. These "stone-like" qualities form a durable shield—protect pipeline enamels from earth loads and soil movement which weaken coatings and permit pipe corrosion to set in.

Pipeline engineers are invited to write for their own copy of PP-34A, a *3-Point Study of Pipeline Coatings and Wrappers*, at no cost or obligation.

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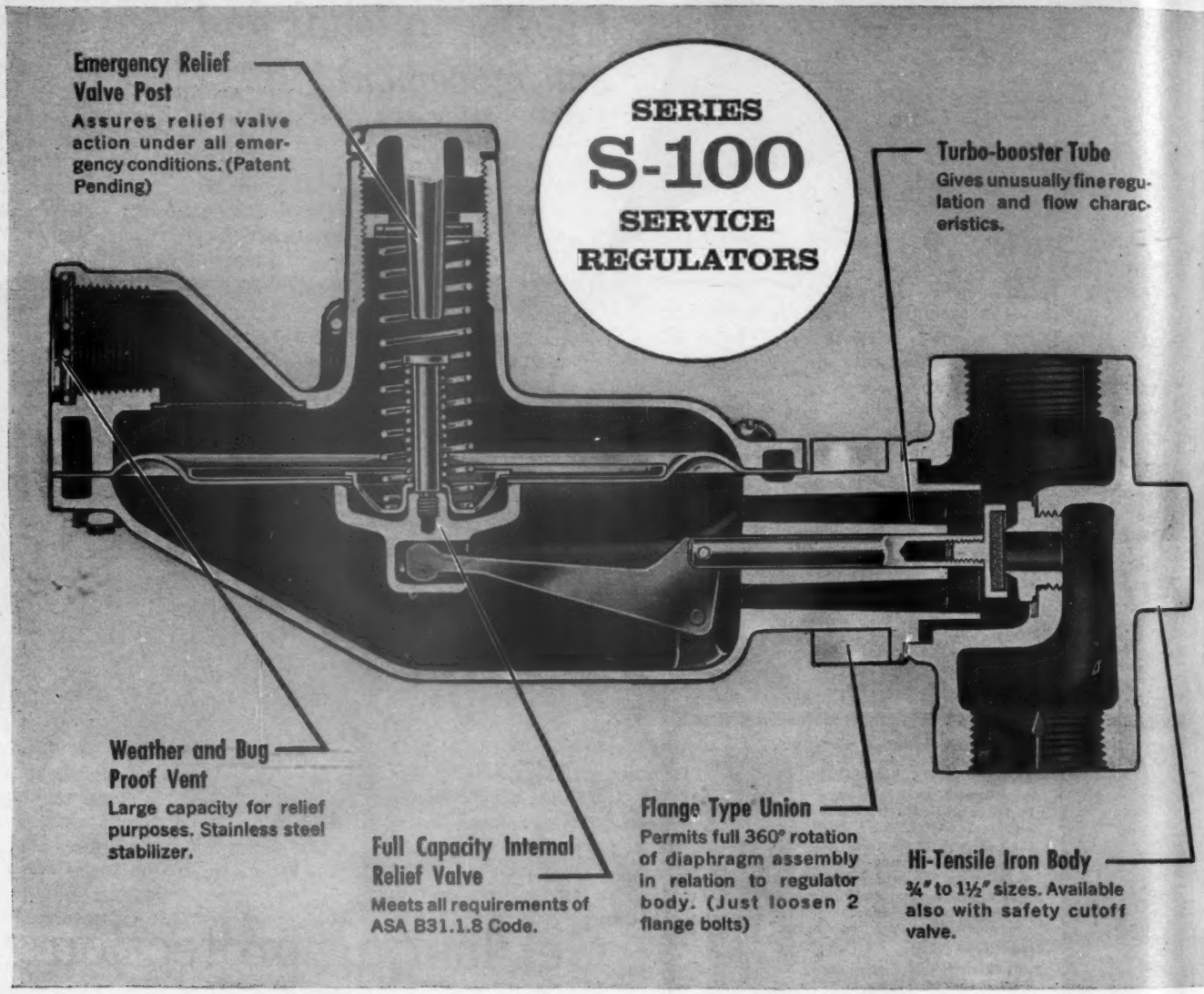
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Permits full 360° rotation of diaphragm assembly in relation to regulator body. (Just loosen 2 flange bolts)
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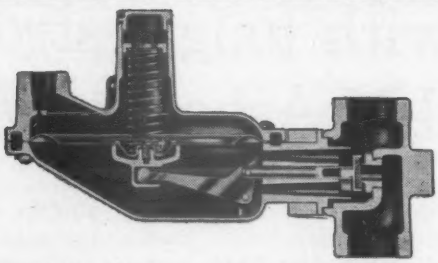
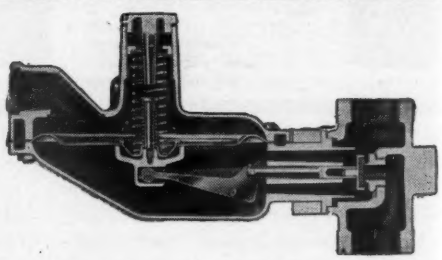
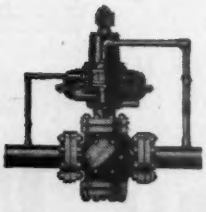


SERIES S100-1—Standard House Service Regulator in ¾", 1", 1¼" and 1½" sizes. Inlet pressures up to 100 psi. Various outlet pressure ranges and vent arrangements available.



SERIES S102-4—Safety Type House Service Regulator with full capacity relief valve. This assembly capable of preventing downstream pressure from rising above safe levels even though the regulator section should be caused to fail in the wide open position.



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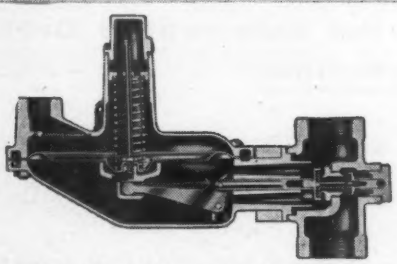
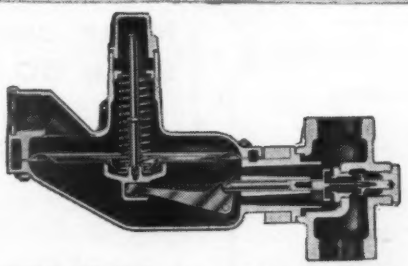
The Fisher S100 is rapidly becoming the most used house service regulator in America.

A complete, descriptive, illustrated bulletin on the Fisher S100 is yours for the asking. Write today for Bulletin Number P-S100.



SERIES S104—Safety Type House Service Regulator with auxiliary valve to close off flow completely in event inlet pressure falls too low, or the flow rate is excessive. Manually reset to resume service.



SERIES S106-4 – Safety Type House Service Regulator with auxiliary valve to close off completely in event inlet pressure falls too low. Manually reset to resume service. The full capacity relief valve prevents downstream pressures from rising above safe levels even though the regulator section should be caused to fail in the wide open position.

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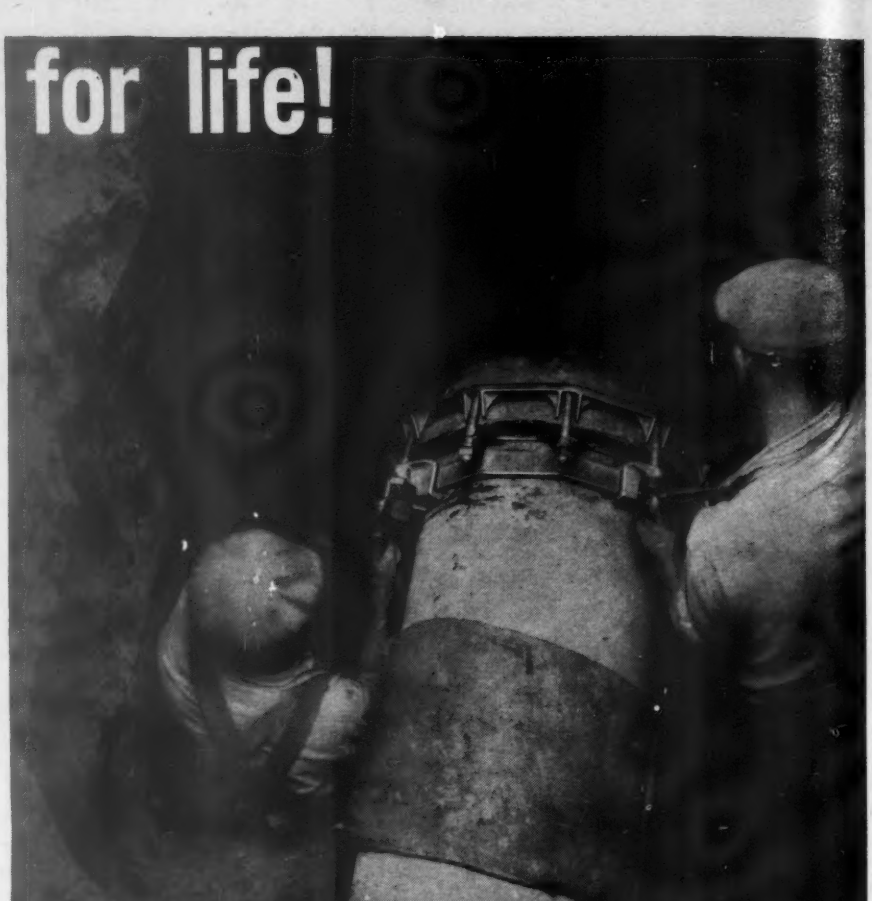
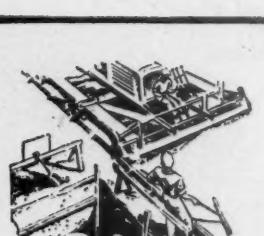
They're making this joint tight for life!



Last step in the installation of a Dresser Style 60 clamp . . . drawing up the bolts. Special-compound rubber gasket maintains gastight seal against caulking compound . . . lasts the life of your pipe. Write for illustrated brochure on the Style 60.



Ahead of Street Paving

When Switching from Wet to Dry Gas

When Boosting Pressure

In Progressive Maintenance Programs

Make clamping with the time-tested Dresser Style 60 standard practice

Rehabilitating and upgrading old cast-iron mains? Be *sure* of permanent joint tightness by using the time-proved clamping method and performance-proved Dresser "Adjustable" Style 60 Bell-Joint Clamps. You eliminate guesswork, and possible hazards.

Proved since 1901, when Dresser provided the first Bell-Joint Clamp, this mechanical, *positive* method for making bell-and-spigot joints gas tight has been approved by gas company operating departments everywhere. Thousands of miles of mains are giving renewed service at higher pressures, safely, after joint reinforcement with Style 60 Clamps.

Preventive maintenance is truly "preventive" when you clamp. Make doubly sure by making the Dresser® Style 60 *standard practice.*

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Twisting under pipe laid on skids, welder joins two sections of a new main in Circleville, Ohio, where Ohio Fuel Gas Company spent $247,000 in 11 construction projects to meet increased residential and industrial demands for gas.

"WHERE GAS IS GROWING"

Distribution Developments

NEWS ABOUT CURRENT AND PLANNED CONSTRUCTION

Arizona Public Service Company, Phoenix, Arizona, has under construction a major gas line project to bring service to 440 new customers in the Paradise Valley area north of Phoenix. Over 140,000 ft of new main will be laid by company crews, including 5000 ft of 6-in., 47,000 ft of 4-in., 62,500 ft of 2-in., and 26,000 ft of 1¼-in. Construction is scheduled for completion in early autumn. The new gas system will operate at a pressure of 50 to 55 psi instead of 25 psi, normal for existing systems.

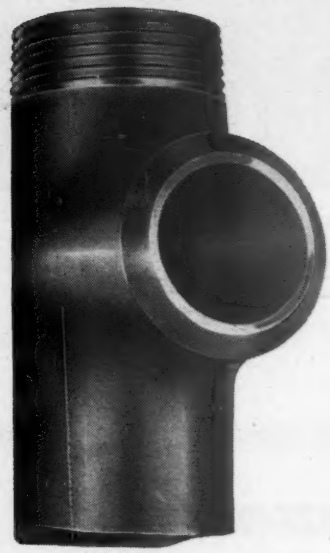
The Gas Service Company, Kansas City, Missouri, has under construction approximately 29,000 ft of 12-in. line in the northern section of Kansas City, Missouri. The new line will strengthen the company's gas supply to the area. The new line will tie in with an existing 12-in. line at International Airport north of the city and an 8-in. line at Gashland.

Columbia Gas of Kentucky, Inc., Charleston, West Virginia, is working on the largest blanket main extension program in its history, a $664,000 project. The new company, a reorganization of Columbia Gas System properties formerly owned by Central Kentucky Natural Gas Company and United Fuel Gas Company, serves 70,000 customers in 40 Kentucky cities and communities. Largest single construction item of the company's current construction program is replacement of a loop line around the city of Lexington at a cost of approximately $348,000.

Arkansas Western Gas Company, Fayetteville, Arkansas, is nearing completion on installation of several miles of 3-in. main to serve new customers in the Zion and Oakland communities northeast of Fayetteville. Company is spending approximately $250,000 in 1958 for extensions, new services, and improvements to its distribution systems.

New
TAPPING TEE
FOR GAS MAINS
by Nibco

PART NO. 4911 - GS
Made from Schedule 40 ASTM A-106 A or B carbon steel



- ***WELDS TO MAIN AND 1-1/4" SUPPLY LINE***
- ***COLD-FORMED FROM SEAMLESS STEEL TUBE***
- ***EXTRA STRONG, EXTRA SMOOTH INSIDE AND OUT***
- ***COMPLETE WITH PLUG AND CAP***

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Dept. H-8008 **Elkhart, Indiana**

One way to span a strait of water is to build your gas main into a new highway bridge crossing the same strait. That's what Pacific Gas & Electric Company is doing. Shown above is the new $26,000,000 Carquinez Bridge, to be completed in late 1958, on which a 26-in. main will be carried. New 3500-ft link replaces two smaller lines. The new line is welded together on the north side of the bridge and moved on rollers and brackets toward the south end as construction progresses.

Inclement weather doesn't slow down crews of Houston Natural Gas Corporation. Wearing protective clothing, company personnel "get the gas through" to new customers. Crew shown here is laying new service lines in the Tanglewood section of Houston.

The NEW *Sherman* PANTHER POWER DIGGER

with Quick Detach and Many Exclusive Features

The introduction of the new Sherman Panther Power Digger obsoletes all other tractor mounted backhoes. Before you buy any power digger, compare it feature for feature with these Sherman advantages: • For all Ford Gas and Diesel Tractors • Rear mounted hydraulic system to eliminate long, power-robbing lines • Special transmission to step up power take-off shaft speed to permit use of small pump delivering 2000 P.S.I. • 25 horsepower hydraulic system • 2-way chevron packings with phenolic top and bottom rings to act as bearings and prevent metal to metal contact between cylinder walls and pistons • Flow control valve to eliminate all chain slack and assure positive control in every digging position • Stress-design box construction boom • Quick detach in a matter of minutes • Reinforced stress-design box dipstick • 19,250 lbs. digging force available • Shock absorbing subframe • Individually controlled stabilizers • 188° uninterrupted arc of swing • and many other features. Write today for Bulletin No. 3186.

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digs them all, big or small, services...extensions...mains

This Cleveland "95" is cutting clean, wide trench in loose dirt and gravel for a new gas main in western Michigan. You can see how easily its discharge conveyor is handling the big volume of spoil from the spudded trench and placing it precisely where wanted for quick and easy backfilling.

The "95" works just as efficiently on small extensions and service lines, too. Highly maneuverable and compact (only 4'9½" across the crawlers) for digging in crowded quarters, its shiftable, reversible conveyor lets it dig right by poles, trees, hydrants, etc.

This usability plus proven reliability over a long life makes your distribution budget dollars go farther with a Cleveland.

The CLEVELAND TRENCHER Co.

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Good Everywhere

Backfilling trench as soon as new main is properly installed is good practice, reducing possibility of accidents resulting from open trench. Tractor-mounted front-end loader, shown here, is one of many units of modern construction equipment employed by Lone Star Gas Company. Job-site is Oak Lawn area of Dallas, Texas.

Northwest Natural Gas Company, Portland, Oregon (formerly Portland Gas & Coke Company), has purchased LPG-air plants in the Eugene-Springfield area and in The Dalles and plans to convert both systems to natural gas when a new lateral line being built by Pacific Northwest Pipeline is completed to the two areas.

Atlanta Gas Light Company, Atlanta, Georgia, is expanding storage facilities for LPG used in its peak shaving operations. Under construction are two more refrigerated tanks at its Riverdale plant, each with a capacity of 1,352,000 gal. Project also includes two refrigeration compressors, a compressor for filling the tanks, and related piping and controls. Contractor for the job is Latex Construction Company of Atlanta. One tank is scheduled for completion on October 15, the second on November 15. At Jonesboro, unloading station for the Riverdale plant, facilities are being increased to speed unloading of LPG tank cars. Nine 30,000-gal conventional pressure-type storage tanks, 500 ft of railroad siding, and additional unloading stands are being added. At Macon, 12 of the 30,000-gal tanks have been installed. In Augusta, 10 tanks have been added, including two transferred from the old oil-gas plant to the new propane plant site on Savannah Road south of the city. In Rome, four tanks have been added, along with a new compressor plant and a vaporizer. The additions will boost the company's LPG storage capacity from its present 4,790,000 gal to 8,439,000 gal.

Distribution Developments

Houston Natural Gas Company, Houston, Texas, is installing a new city gate station and a new regulator station at LaPorte, Texas, which will include remotely controlled equipment. New tie-ins are also planned between existing mains to provide a new feed in the LaPorte distribution system. Company also has underway construction of a new building in Freeport.

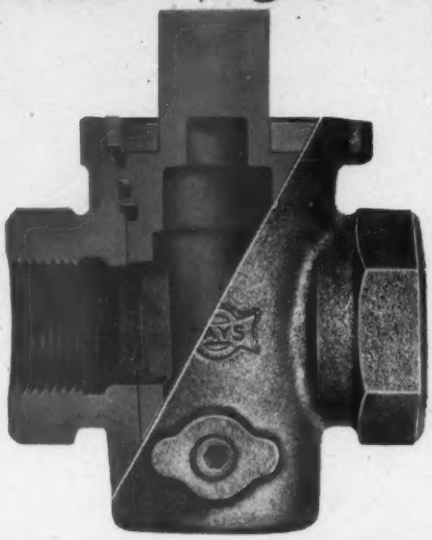
Laclede Gas Company, St. Louis, Missouri, plans a new $750,000 extension of its distribution system to supply gas for heating and processes at the Plymouth automobile assembly plant at Valley Park, a new $50,000,000 industrial development. Laclede's continuing expansion program is progressing at the rate of $1,000,000 per month to provide better service for its customers via new facilities, Laclede President Reid Derrick said recently.

Ohio Fuel Gas Company, Columbus, Ohio, plans to develop a new underground gas storage area in Medina County, Ohio, the 11th to be operated by the company. When fully developed, the new storage area would have a capacity of 8.5-billion cu ft of gas. Estimated cost, when completed, is $3,846,000.

Gas Department of New Orleans Public Service, Inc., paints its portable equipment bright yellow for extra visibility, both day and night. New rotary compressor, above, latest addition to department's equipment, is shown on job-site, along with proper barricading.

Washington Gas Light Company, Washington, D. C., is doing considerable relocation work this summer in advance of new highway construction. Relocation projects include replacement of some 5000 ft of 16 and 24-in. mains with 5000 ft of 24-in. main on First Street, S. W., in the capitol city; installation of new mains and replacement of services on M Street N.W.; and replacement of approximately 11,000 ft of main and several thousand services on the District's new "crosstown" route. In its Maryland service area, work along University Boulevard includes replacement of an older 8-in. main with a new 12-in. main, and replacement of a 12-in. main with a 16-in. main. Both replacements total about 35,000 ft of new pipe, and services along the route are also being replaced.

THIS GAS STOP WILL NOT STICK...



- A newly designed HAYS Lubricated and Tamper-Proof Gas Stop . . .
- Stop is completely lubricated at the factory . . .
- Four Grooves in body, and Lubricant Plug provide for pressure re-lubrication . . .
- Locking Pin positively prevents tampering at top of stop . . .
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Re-Lubrication does the TRICK

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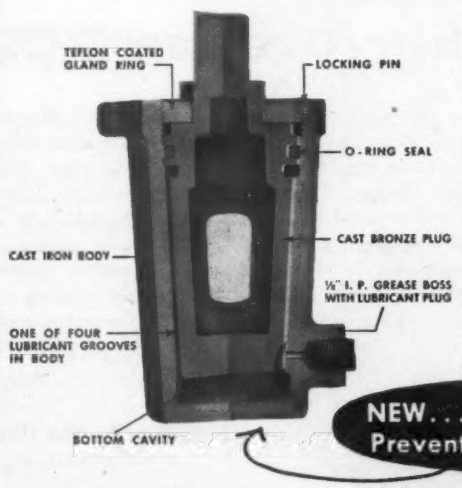
LUBRICATED TAMPER-PROOF SAFETY GAS STOP*



- Lower initial and turning torque . . .
- Extra grade gray iron body, gas service bronze plug . . .
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- Black or Galvanized, Flat Head or Lockwing Pattern...
- Sizes: ¾", 1", 1¼", 1½", 2", for 125 psi. W. P.

Write for Folder 121 and prices.

*Patent applied for.

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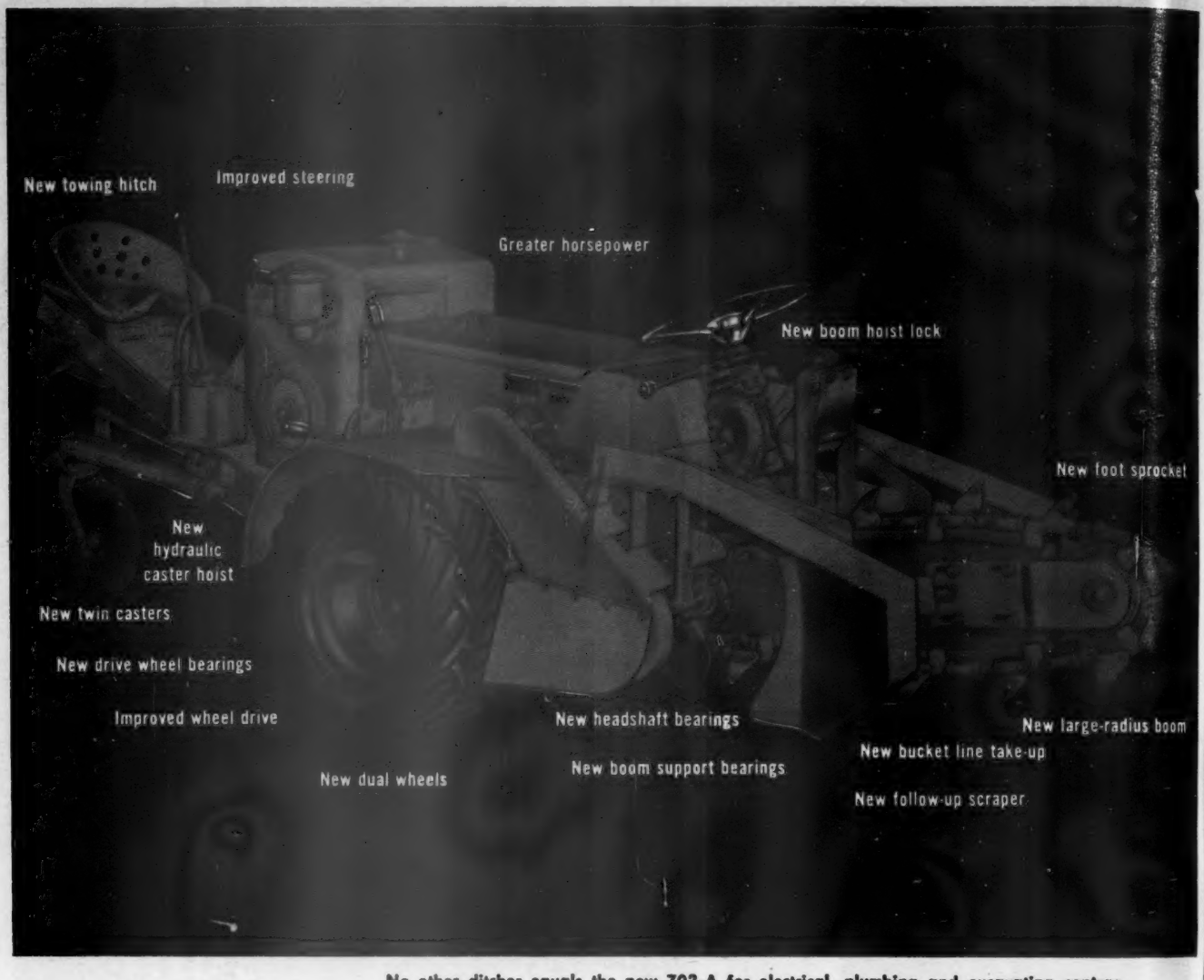

No other ditcher equals the new 702-A for electrical, plumbing and excavating contractors, railroads, utilities, telephone companies, and government bodies. Write for literature.

Easier operation, reduced maintenance, greater maneuverability with

New Barber-Greene 702-A Ditcher

New cost and performance records for underground placement of gas, water, electric and telephone services, sprinkler systems, and all other work requiring narrow trenches were set by the Barber-Greene Model 702 Ditcher. The new Model 702-A offers even faster, more economical digging.

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Greater horsepower and new reduced bucket line speed allow digging through tougher materials. New hydraulic caster hoist makes height adjustment easier, more accurate. Optional dual wheels allow machine to operate on unstable bases. Optional electric starter.

The 300% more brake area and improved lever action make steering easier, more accurate. Optional follow-up scraper assures clean trench. New bucket line take-up is readily accessible.

Faster towing with new tapered roller wheel bearings and improved towing hitch. Optional twin casters give better stability and steering, and allow machine to straddle trench.

58-43-D

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CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

Summer Brings Construction . . . . and Small Boys

Inquisitive young cowboy (left) interrupts Northern Illinois Gas Company crew installing main in new subdivision, part of $141,000,000 allocated for construction during 1958-1962.

Barefoot boy balances on one foot as he watches operator of tractor-mounted backhoe dig bellhole on a $26,000 project in Port Washington, Ohio, for Ohio Fuel Gas Company.

Brooklyn Union Gas Company, Brooklyn, New York, has under construction a new $2,700,000 service center at its Greenpoint Works, to provide better service for customers in the northern portions of its Kings and Queens districts. The one-story, three-building service center will require 10 acres of space at the Works site. One building will house Customer Service and Street Sections. The second will be a garage and include an automobile repair shop to serve the entire company system. Third building will contain a storeroom, stationery storage, and a tool room. A large outdoor storage area will be provided for pipe and large fittings.

Ohio Fuel Gas Company, Columbus, Ohio, plans to increase system pressure on sections of its system in Bucyrus, Ohio, and is currently installing house regulators at 1090 homes in the areas involved. At Ridgeville, Ohio, the company has completed work on two projects involving installation of 10,520 ft of new 4-in. main to serve new customers in that area. Don Miller, Inc. and Burkhardt Construction Company were contractors on the projects.

A FAVORITE EVERYWHERE . . . CROSE EQUIPMENT,

MATERIALS & SUPPLIES

FOR GAS DISTRIBUTION . . .
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- CROSE CLEANING AND PRIMING MACHINES. In both line-traveling and stationary models . . . for faster, trouble-free service.
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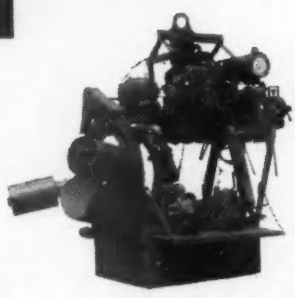
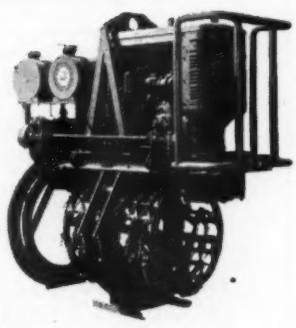
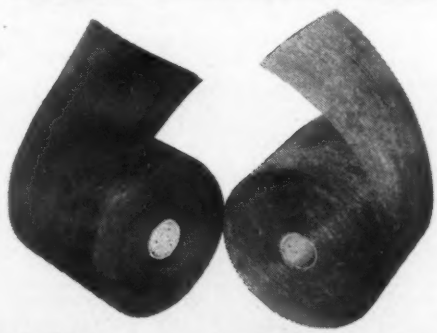
- BLUE FLAG L-O-F GLASS FIBER PIPE WRAP, JOHNS-MANVILLE FELT, SEALTIGHT PIPE SHIELDS.

Crose offers a most complete line of equipment for the gas distribution industry. Crose equipment, materials and supplies are always available to you on shortest notice—we have many strategic supply points and use fastest transportation methods. Always check first with Crose on any pipeline construction and maintenance needs.







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Construction work is in full swing throughout Atlanta Gas Light Company's service areas as company builds to keep up with continuing demand for natural gas and to modify its system in line with civic growth. At left, large tapping machine cuts 16-in. main at Piedmont and Cain Streets in Atlanta where main is being re-routed because of expressway construction. Original main is tapped for a by-pass to allow gas to flow without interruption of service while re-routed main is installed. Above, 16-in. main will be re-routed in trench in foreground along Atlanta's Houston Street. New expressway will run along elevated route at right, under construction.

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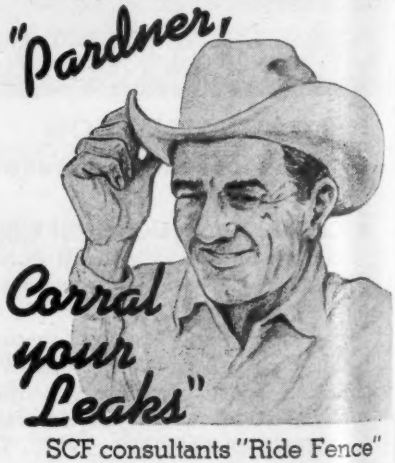

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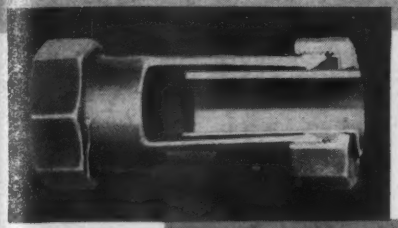

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all malleable
coupling
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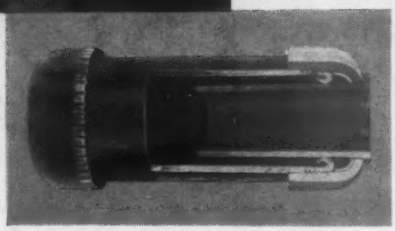

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coupling
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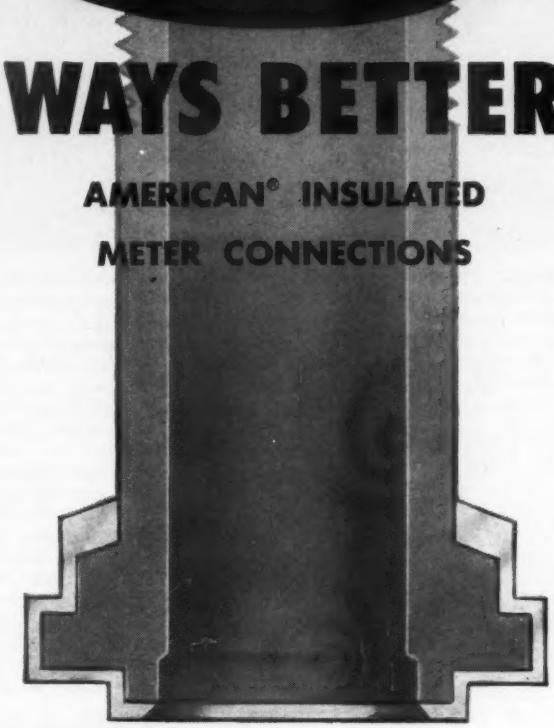

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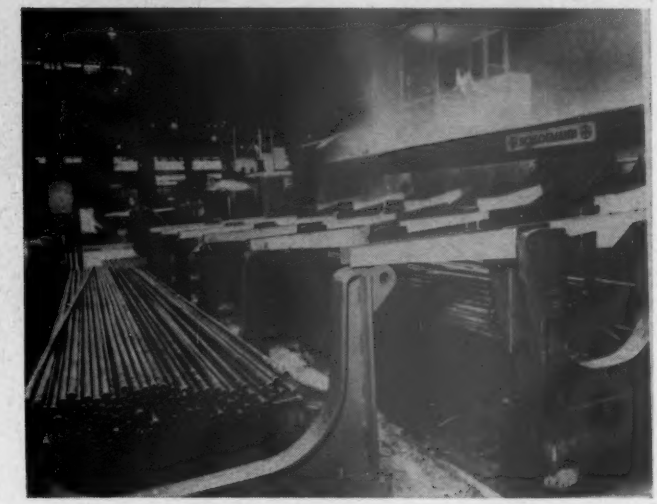
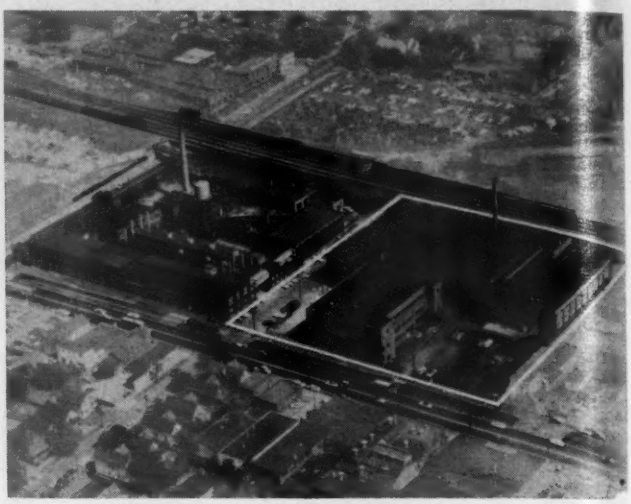


Pipe Mill in Production. Jones & Laughlin Steel Corporation has put into operation the second of two modern continuous weld pipe mills at its Aliquippa, Pennsylvania, Works. At a cost of nearly $17,000,000, the new mills have incorporated advanced design features that assure high quality in small-diameter pipe. The new continuous weld pipe mills replace two butt weld mills constructed in 1926. Latest of the two mills produces pipe in sizes from 1¼ through 4-in. The first mill, completed in 1957, has a size range of ½ through 2-in.



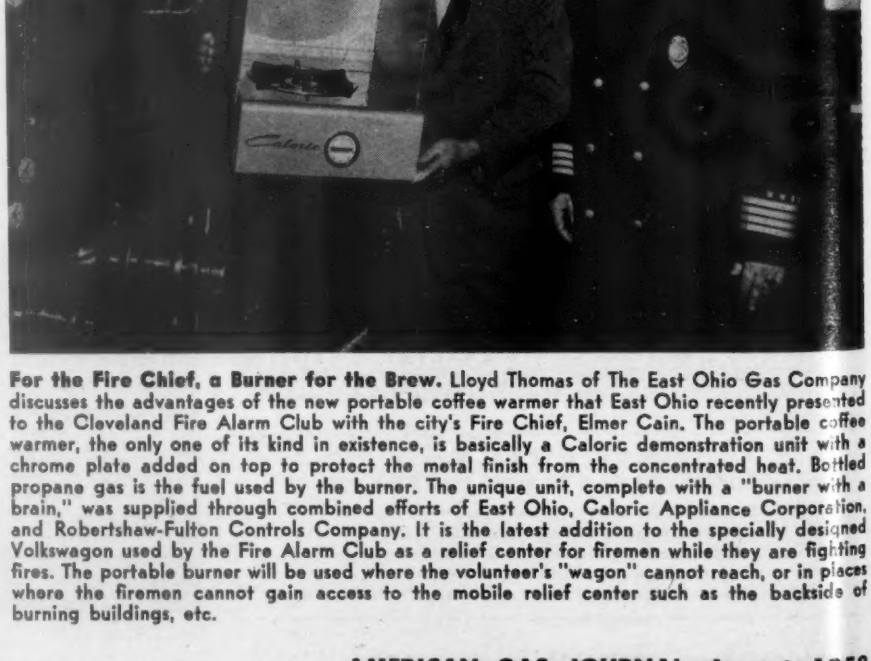
Hays Manufacturing Company of Erie, Pennsylvania, has acquired new facilities (outlined in white) to be used in addition to the original plant buildings on the left. New quarters include 115,000 sq ft of modern factory and office space, and represent the latest step in a program to provide adequate facilities for Hays' three divisions. More than 3500 cataloged products are manufactured by Hays, complete from drawing board, pattern shop and foundry, to final assembly.

Merger. Councils of the American Society of Heating and Air-Conditioning Engineers have approved in principle a method of merging the two societies. Present plans contemplate that the proposal for a merger and proxy ballots will be officially mailed to members of both societies in late October.

Long Island Lighting Company has retired from the retail merchandising of both gas and electric appliances in favor of the local progressive merchant who is "well qualified to give the consumer what he wants." LILCO's advertising campaign will promote "Look for the LILCO Emblems" that will single out the experienced merchant of good reputation. Wilmot O. Smith, vice president in charge of gas and electric sales, said LILCO will continue to make free heating surveys, prepare cost estimates on gas heat, and cooperate in every way with local plumbers, appliance dealers, and electrical contractors so that the consumers may enjoy the full benefits of modern appliances.

Philadelphia Gas Works has upped the Btu content of gas supplied to the city of Philadelphia from 720 to 750 Btu to affect some minor economies for PGW in production costs and provide increased storage, pumping and distribution capacities. A change in the billing procedure will be made as a cubic foot of 750 Btu gas has 4.166 percent more heating value than a cubic foot of 720 Btu gas, a Philadelphia Gas Works spokesman said. Since meter readings indicate the number of cubic feet of gas used without regard of its thermal content, it will be necessary to use a conversion factor in billing procedures to reflect the increase in heating value of gas consumed. This will not increase however, the cost of gas to the consumer will not increase for the factor maintains the same cost for the same amount of heating value used.

Matches Outmoded. Announcement that all gas ranges must be completely equipped with automatic ignition in order to qualify for the AGA seal of approval after next January 1 followed action by AGA board of directors which ended speculation as to when the mandatory requirement might go into effect. Originally, the requirement was to become effective at the beginning of 1957, but a two-year postponement was decreed. Previously, only automatic ignition of top burners has been required for gas ranges bearing the approval seal. Automatic ignition for commercial gas cooking equipment has been in effect since January 1957. Automatic ignition for gas ranges has been available since 1938, but was not mandatory under the approval program except for top burners. Approximately 23 percent of all gas ranges sold last year included automatic ignition.



For the Fire Chief, a Burner for the Brew. Lloyd Thomas of The East Ohio Gas Company discusses the advantages of the new portable coffee warmer that East Ohio recently presented to the Cleveland Fire Alarm Club with the city's Fire Chief, Elmer Cain. The portable coffee warmer, the only one of its kind in existence, is basically a Caloric demonstration unit with a chrome plate added on top to protect the metal finish from the concentrated heat. Bottled propane gas is the fuel used by the burner. The unique unit, complete with a "burner with a brain," was supplied through combined efforts of East Ohio, Caloric Appliance Corporation, and Robertshaw-Fulton Controls Company. It is the latest addition to the specially designed Volkswagon used by the Fire Alarm Club as a relief center for firemen while they are fighting fires. The portable burner will be used where the volunteer's "wagon" cannot reach, or in places where the firemen cannot gain access to the mobile relief center such as the backside of burning buildings, etc.

Research Center. Robertshaw-Fulton Controls Company has opened a $500,000 research and development center in Anaheim, California, in support of a forecast that the American home will change more in the next 30 years than in the last 300. The installation will be used to develop systems and automatic controls for air conditioning, space heating, water heating, refrigeration, food preparation and preservation, laundering, and other major home appliances. A furnished and equipped contemporary California home erected adjacent to the main laboratory building will be used for testing home appliances and automatic controls in actual living conditions.

Judges Chosen for AGA's PR Competition. American Gas Association has chosen three leaders in the public relations and publications fields to serve as judges in its second annual Public Relations Achievement Award competition. They are: Kenneth W. Haagensen, president of the Public Relations Society of America and director of public relations, Allis-Chalmers Mfg. Co., James L. Macwithey, president of the American Public Relations Society and director of public relations, Bristol-Myers Company, and Francis X. Welch, editor of *Public Utilities Fortnightly*. Trophies and certificates will be presented at the AGA annual convention in October for "outstanding contributions to greater understanding of the gas industry and modern gas service.

Portland Gas & Coke Company has officially shed its old name for Northwest Natural Gas Company. The new name is more suited for a utility that now serves ten counties in two states and is virtually out of the byproducts business that was part of its former oil-gas manufacture, Charles H. Gueffroy, president of the company, explained. The Portland-based company has purchased the butane air facilities at Eugene and Springfield, Oregon, from Cascade Natural Gas Company and an agreement for purchase of The Dalles Natural Gas Company at The Dalles, Oregon, is awaiting approval of the Oregon Public Utility Commissioner.

Cascade Natural Gas Corporation and The Washington Water Power Company have signed a purchase agreement involving $1,250,000 to transfer all of Cascade's gas distribution system in Lewiston, Idaho, and Clarkston, Washington, to WWPCo. The Lewiston and Clarkston systems, located furthermost to the east of Cascade's properties, currently lists 1200 gas customers. Kinsey M. Robinson, president of WWPCo, said that purchase of these gas properties fits in with WWPCo's electric operations and will make a more desirable operation of the two services on an integrated basis.

Fisher Governor Company's spring gas regulator conference held recently in Marshalltown, Iowa, was attended by 60 men representing 25 gas utility companies. Classes conducted by Fisher sales and engineering personnel covered design, production, installation, and maintenance of gas regulators. Tours of the factory and offices familiarized visitors with the production and order handling facilities.

GAMA's Gas Incineration Division has appointed Morey, Humm & Warwick, Inc. of New York to handle its advertising and sales promotion program. The campaign will include both national and regional introduction of a new smokeless-odorless gas incinerator.

Latest tricks of the trade. More than 50 significant new technical developments in gas utilization will be on exhibit for delegates of the American Gas Association's 40th annual convention in Atlantic City October 12-15. Plans for the "Parade of Gas Progress" exhibits are being finalized at this time. H. Vinton Potter, vice president of Oklahoma Natural Gas Company, is chairman of the exhibit planning committee. Other committee members include: Julius Klein, Caloric Appliance Corporation; J. J. Quinn, Boston Gas Company; Christy Payne Jr., Peoples Natural Gas Company; P. R. Shea, Southern California Gas Company, and Frank H. Trembly, Philadelphia Gas Works Division.

Appalachian Gas Measurement Short Course. J. C. Templeton, vice president of Arkansas-Louisiana Gas Company, will present the principal address at the 18th annual meeting of the Appalachian Gas Measurement Short Course to be held August 25-27 at West Virginia University, Morgantown, West Virginia. Information on application, operation, and repair of natural gas quantity measurement and pressure regulation equipment will be presented. Latest developments of this equipment will be exhibited by 45 of the nation's leading gas equipment manufacturers. Instructors for the various classes and forums are technical experts from the industry, research and universities. James W. Chrisman of The East Ohio Gas Company is the general chairman and Carl D. Rader of Tennessee Gas Company is the program chairman.

Baso Inc. and Minnesota Mining & Mfg. Co. have announced an agreement by which 3M will continue certain research and development programs involving thermo-electric materials and devices formerly conducted by Baso. Development and sale of a variety of thermo-electric generators, with emphasis on devices for the control of gas-fired and other fluid fuel burning apparatus will be continued by Baso. Patents and patent applications which 3M has purchased from Baso relate to thermo-electric devices and materials with applications outside the fluid fuel burning field, and include compositions of lead telluride.

Gas Runway Lights. North Little Rock Municipal Airport will have the first gas runway lights in the United States when Arkansas Louisiana Gas Company installs the lights in the near future. O. W. Noble of the Noble Air Service announced the Civil Aeronautics Administration had approved the North Little Rock Airport lights and was so sold on them that plans called for their installation at the Oklahoma City airport. Russelville, Arkansas, is also slated to install gas runway lights soon.

Institute of Gas Technology 1958 summer session enrollment is the largest in the seven-year history of the session. A total of 119 men, gas engineers from all parts of the United States and Canada, and from England, Pakistan, and Hawaii are enrolled in the summer session which is divided into intensive three-week courses, each covering one of the general fields of natural gas operations — production and processing, transmission, distribution, and fuel utilization.

Floyd L. Larkin, vice president in charge of industrial relations of Wisconsin Electric Power Company, has been elected president of the Wisconsin Utilities Association succeeding S. Lloyd Nemeyer, president of Milwaukee Gas Light Company who has moved up to board chairman of the association. Nemeyer succeeds R. W. Leach of Racine, Wisconsin.

F. L. Larkin

S. L. Nemeyer

Other officers of the association include Stuart V. Willson, president of Northern States Power Company who was re-elected and installed as vice president, and Earl G. Frank, Milwaukee Gas Light Company, who was re-elected and installed as treasurer for his third straight term.

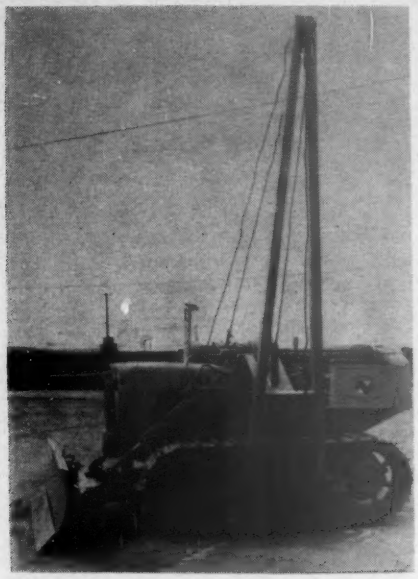
Gas Heat Shipments Show Sharp Rise. An improved home construction picture nationally and continued expansion of natural gas and liquefied petroleum gas supplies have been reflected in a sharp rise in May of shipments of gas-fired furnaces, boilers, and conversion burners for residential central heating. A GAMA summary revealed for the three categories combined, the latest monthly total, 74,100, was up 14 percent over the 65,000 in May of 1957. For five months, the 1958 total of 318,800 amounted to a 2.7 percent gain over the like 1957 period, when 310,300 were shipped.

Hevi-Duty Electric Company, Milwaukee, Wisconsin, has added a gas-fired heat treating, forging, and melting furnace to its line of electric heat treating furnaces through the acquisition of the furnace business of Eclipse Fuel Engineering Company in Rockford, Illinois. Hevi-Duty will immediately begin manufacture of all gas-fired furnaces formerly produced by Eclipse. Sales and engineering records of previously produced Eclipse furnaces will be maintained by Hevi-Duty.

Product Previews

FOR THE GAS DISTRIBUTION INDUSTRY

For more information on items described here in brief, use the handy reply card and circle the corresponding numbers

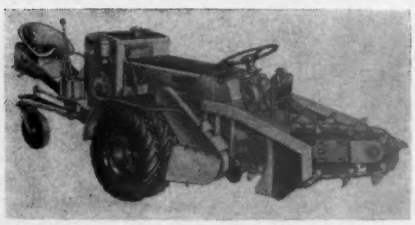


Sideboom Attachment for Small Tractors. Midwestern Manufacturing Company has added another unit to its line of hydraulically operated sidebooms for small tractors. New unit is designed for Case-Terra-trac Model 600 industrial crawler tractor with 60-in. gage tracks, and will handle up to 12-in. pipe with a lifting capacity up to 10,000 lb. Sideboom utilizes the newly designed double cable drum arrangement, and other hydraulic features characteristic of Midwestern's line. *Midwestern Manufacturing Company.*

CIRCLE (43) ON THE REPLY CARD

Map Case. New lightweight, tamperproof aluminum map-carrying case for carrying or shipping rolled maps, drawings, plans, and blueprints are now available from Scott-Rice Company. Available in three standard sizes, the 3-in. diameter Saf-Tee Case accommodates rolled subjects to 60-in. Made of an aluminum alloy and equipped with a leather grip handle and steel hasp for padlock, case can take rough usage. Cases can be furnished to custom lengths on special order. *Scott-Rice Company.*

CIRCLE (44) ON THE REPLY CARD

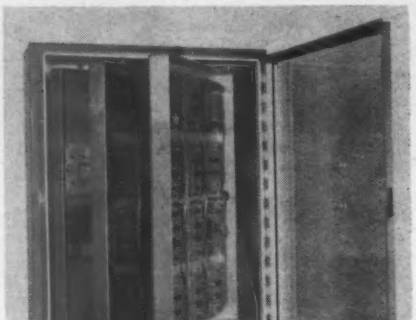


Rubber-Tired Ditcher. Barber-Greene has announced a new model 702-A rubber-tired ditcher that is a highly mobile unit designed for narrow trenching. New 702-A succeeds B-G's model 702. Unit is designed to dig a maximum of 40-in. deep; may be equipped with either a chisel tooth bucket line digging either 3 or 5 in. wide; or a hook tooth line digging 3½ or 5 in. wide. This choice makes unit readily adaptable to wide variety of soil conditions. *Barber-Greene Company.*

CIRCLE (45) ON THE REPLY CARD

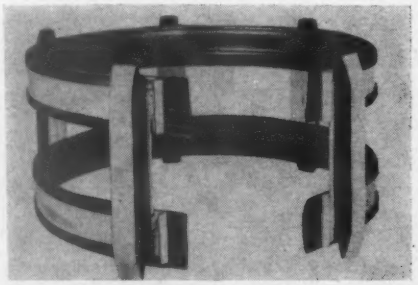
Small Pipe Reamer. New ratchet pipe reamer, Toledo No. 182, made especially for small pipe, has a seven flute design that removes chips better and improves the unit's cutting qualities. Unit is designed for faster reaming and to eliminate gouging. Unit feeds into the pipe with only light pressure, is easily resharpened and has a pipe capacity of ⅛ to 2-in. *Toledo Pipe Threading Machine Co.*

CIRCLE (46) ON THE REPLY CARD



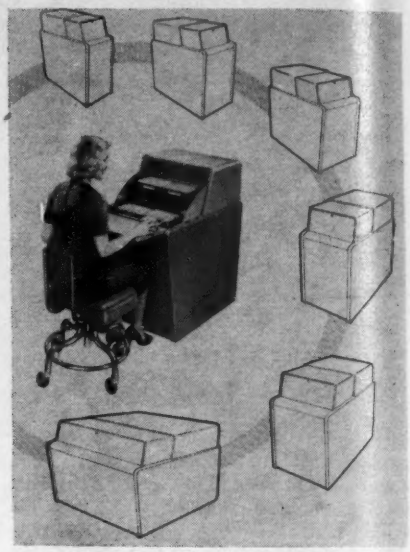
Telemetering Transceivers. Southwestern Industrial Electronics Company has announced its TTR-series Telemetering Transceivers that are designed for transmission and reception of digital information over telephone lines, radio, or microwave links. This unique pulse code system provides output — without conversion equipment—for data handling, computing, printing, or supervisory control systems. TTR master and TTR-A slave units are used for remote control and central data gathering, and for control and monitoring operations. *Southwestern Industrial Electronics Company.*

CIRCLE (47) ON THE REPLY CARD



Pipe Cradles. Malone Model 58 full encirclement cradle supports the pipe carrier end, within the casing, all the way around the diameter. Body of cradle is composed of two bands of steel, two inches wide, with an overall width of seven inches. Runners are made of steel and neoprene. Ribbed rubber lining on the bands provides double insulation and protection to the pipe coating. Built-in tension in the cradle allows installation without bolting. With cradle installed, backfill cannot displace the carrier pipe against the casing in any direction. Unit is available in any combination of carrier-casing pipe sizes. *F. H. Maloney Co.*

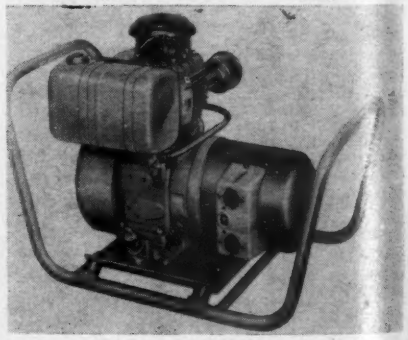
CIRCLE (48) ON THE REPLY CARD



Automatic Rotary Files. Three new unit sizes have been added to Diebold's recently introduced rotary file line. Motorized line now includes six models with 54 to 585 filing inches all available with dial-a-file record selector control which brings any desired form directly to the operator's fingertips in seconds time at a flick of the dial. All records housed in individual trays revolve in an upright position, eliminating necessity of devices to prevent record fall out while file is in motion. This advantage permits guiding across the entire top of record row, employment of self-indexers, and housing of tissue thin sales slips. Trays do not have to be filled with unused blank cards to maintain secured records. *Diebold, Incorporated.*

CIRCLE (49) ON THE REPLY CARD

Portable Electric Generator. Direct-coupled, beltless portable electric generator with a capacity of 2.5 kw, supplying 115 v of direct current, has been developed by Thor's construction equipment division. New model (EG-2.5D) weighs 165 lb dry, and is 31¼ in. long, 20 in.



wide and 19½ in. high. Features include sealed-for-life bearings and long-life commutators and brushes. Generator is mounted horizontally on tubular frame which also serves as carrying handle. Unit's gasoline engine is 4-cycle, single-cylinder, and air-cooled with an aluminum alloy piston, stellite valves, and replaceable seats. Nominal engine speed is 3600 rpm. Manual rope starter provides quick starting. *Thor Power Tool Co.*

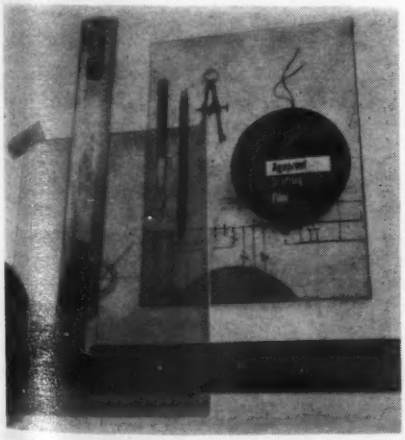
CIRCLE (50) ON THE REPLY CARD

Pipe Drilling Machine. An automatic, high-pressure drilling machine for making cuts from 2 through 6-in. in any type of pipe has been announced by Mueller Company. Designated the "CH-6," the machine is intended for use on gas distribution systems where connections are required under pressure and features direct-reading tool position and feed indicators and automatic disengagement of the tool feed. Maximum working pressure of the unit is 1440 psi at 100 F; maximum working temperature is 500 F at 1250 psi. *Mueller Company.*

CIRCLE (51) ON THE REPLY CARD

Glow-In-Dark Uniforms. George Master Garment Company has adapted Scotchlite to uniforms for companies having employees who work after dark. With the new uniform, every night time employee becomes a walking "spectacular" complete with company name and emblem design wherever he goes, wherever he's seen. And the reflective power of the glow-in-the-dark uniforms act as a safety feature guarding workers against after dark accidents. *George Master Garment Company.*

CIRCLE (52) ON THE REPLY CARD



Ageproof Film. Eugene Dietzgen has developed an "Ageproof" film, that is a tear-proof drafting medium with unique drafting qualities. The new material withstands usage that would normally destroy other drafting materials. Repeated erasures, folding and handling have virtually no effect on the drafting surface of the film. *Eugene Dietzgen Company.*

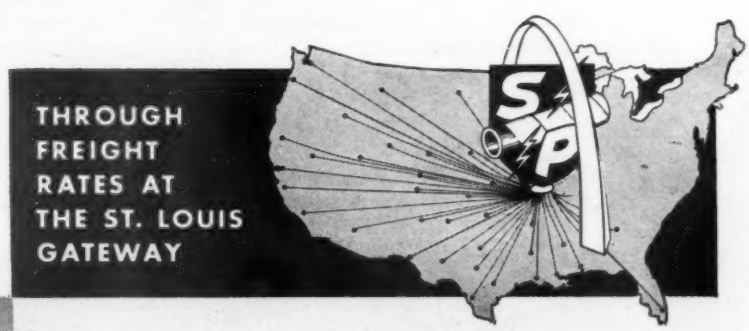
CIRCLE (53) ON THE REPLY CARD

with

STEEL GRIT CLEANING

The ping of millions of pieces of steel grit bouncing off your pipe at Standard Pipeprotection assures you that your pipe is being cleaned to perfection. Not only is all mill scale and rust removed, but the surface of the pipe is etched with many tiny facets, inclined toward each other at various angles, that provide an ideal surface for bonding the enamel to the pipe.

Steel grit cleaning is far superior to sand blasting or wire brushing. Every piece of pipe is steel grit cleaned at SPI.



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BOOKSHELF

Materials Handling Applications, *by D. Oliphant Haynes, published by Chilton Book Division, 56 & Chestnut Streets, Philadelphia 39, Pennsylvania. Pages, 381. Price, $12.50.*

Companion volume for "Materials Handling Equipment," this new book offers practical advice and information on improving a materials handling program at commercial and manufacturing levels. It is simple and non-technical in its approach. Basic, how-to information not only for individual jobs, but on entire programs as well, are included. The author illustrates how materials handling programs can be adapted to all kinds of situations in factories, railroads, trucks, and loading platforms. Various types of containers, boxes, barrels, kegs, bales, as well as the peculiar qualities of different kinds of materials are taken up individually.

Planning Ahead for Profits, *published by the American Management Association, Inc., 1515 Broadway, Times Square, New York 36, New York. Pages, 172. Price, $4.50.*

Increased competition makes long-range product planning essential. To be effective, however, planning for salable new products requires coordination at all levels of management. In Management Report 3, leading companies describe their methods of getting this coordination. Discussed are the basic elements of long-range product planning and development, the future outlook for production and marketing, the role of economic and market research in long-range planning, ways of establishing corporate objectives for product programs, and organization planning as a coordinate approach to product development.

Plant Engineering Practice, *prepared by editors of* PLANT ENGINEERING, *published by F. W. Dodge Corporation, 119 West 40th Street, New York 18, New York. Pages, 704. Price, $18.50.*

New handbook covers every major area of plant engineering activity. Entirely practical in nature, the book offers tested solutions to the many daily problems that the plant engineer and his staff encounter. More than 100 experts in fields related to plant engineering wrote the 226 detailed studies organized into 13 extensive sections: Sites and layout, construction, housekeeping and safety, materials handling, maintenance, paints and protective coatings, mechanical power and piping systems, electric power, lighting, utilities, heating ventilating and air conditioning, instrumentation and quality control. Over 800 illustrations.

What Everyone Should Know About the Advantages of Investor-Owned Gas Companies, *published by American Gas Association, 420 Lexington Avenue, New York, 17, New York. Pages, 16. Prices, 10 cents for 1 to 100; 9 cents for 101 to 2000 copies; and 8 cents for 2001 and above.*

New PAR Public Information tool to help utility men tell the story of the gas industry progress under investor ownership is now available from the Public Information Bureau. The 16-page booklet is a fast-paced, cartoon-illustrated handout or mailing piece for distribution to employees, investors, customers and special groups. It gives easily assimilated facts contrasting the pitfalls of government ownership with the merits of competitive enterprise.

Graphic Science: Engineering Drawing, Descriptive Geometry, and Graphics, *by Thomas E. French and Charles J. Vierck, published by McGraw-Hill Book Company, 330 West 42nd Street, New York 36, New York. Pages, 758. Price, $8.50.*

Book is aimed at a complete understanding of graphical methods as they relate to the problems of the engineer, not to the problems of the draftsman. This enables the engineer to become more competent to specify graphical procedures in accomplishing engineering work of a wide variety. Focus throughout is on drawing as a tool for the engineer. Basic pattern of the book offers a presentation of the fundamentals of projection and projection drawing, a coverage of descriptive geometry, and a discussion of graphical solutions.

Influence of Port Design and Gas Composition on Flame Characteristics of Atmospheric Burners, *AGA Laboratories Research Bulletin 77, published by American Gas Association, 420 Lexington Avenue, New York 17, New York. Pages, 71. Price, $2.50.*

Research bulletin presents relationships for the correlation of burner geometry, gas composition, and appliance environment with the conventional flame characteristics of lifting, yellow tipping, and flashback. Applications of this information to actual design of gas burners is given. Examples are given for designing burners for flexible operation, both with a number of base load gases and for substitution of one gas for another without readjustment.

REYNOLDS trouble-free and accurate

INTERNAL RELIEF VALVE

This new Reynolds relief valve has a double action sealing effect which permits the use of a large relief valve orifice which still seals and relieves within close regulation.

An Automatic quick opening flapper for excess pressure gas and yet has standard small vent opening for normal regulation.

The all stainless steel construction flapper valve eliminates high shock-lock off common to other type regulators.

Also available on NRT8010 series No. 1 Model 10, No. 1 Model 20, and No. 1 Model 30 series.

GAS CONTROL SINCE 1892

Not Shown—A Complete Line of Outside Vent Protection

Write for detailed information

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No Service Calls for One of These Vents!

Only when a utility service-man sees the red-and-black Metalbestos "Safety System" Seal can he be sure that vent failure isn't responsible for the consumer's service call. Then he knows that trouble lies below the draft hood... because the Safety Seal tells him an all-Metalbestos vent has been designed and installed according to the Metalbestos "Safety System" Gas Vent Tables.

The vent system behind the Metalbestos "Safety Seal" eliminates venting service calls... promotes the consumer's total enjoyment of gas heat.

Look for the Metalbestos "Safety Seal" and encourage its use. It's good for your business... good for gas.

For complete information on the new Metalbestos "Safety System" write Dept. AA-4.

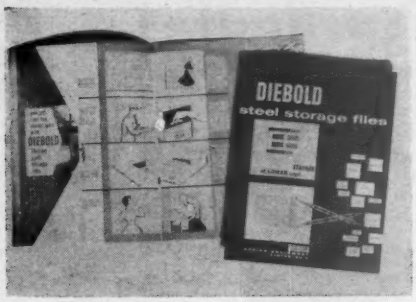
Stocked by principal distributors in major cities. Factory warehouses in Akron, Atlanta, Dallas, Des Moines, Chicago, New Orleans, Los Angeles, Woodbridge, N.J.

METALBESTOS DIVISION
WILLIAM WALLACE COMPANY · BELMONT, CALIF.

Bulletin Board

NEW BOOKS...BROCHURES...CATALOGS

For more information on items described here in brief, use the handy reply card and circle the corresponding numbers



Steel Storage Files. New 16-page, two color catalog covering Diebold's line of steel storage files is now available. First two pages of catalog pinpoint four key advantages steel storage files bring to every record storage situation: Increased storage room capacity; unique locking feature that eliminates need for shelving, bracing or assembly tools; lifetime service and increased efficiency because records can be stored according to uniform filing procedure. Balance of catalog expands on these advantages while illustrating range of size and styles available. *Diebold, Incorporated.*

CIRCLE (103) ON THE REPLY CARD

Wheel-Type Ditcher. New 16-page two color folder describes Barber-Greene's new model wheel-type ditcher. Ten features of the new model 774 include dual-range hydra-crowd or hydraulic crowding control; flexible drawbar; a new digging wheel drive, eliminating long, wrap-around chains and assuring equal contact on both sides of the wheel; an all hydraulic spoil conveyor drive; special trouble-free crawler design; automatic electric overload protection; hydraulic brakes; hydraulic boom hoist and other use of hydraulics in controls. Final feature is rapid convertability of unit to model 784 vertical boom ditcher. *Barber-Greene Company.*

CIRCLE (104) ON THE REPLY CARD

Threadless Fittings. New display for use of jobbers and dealers is now available for Telsco "Grip-Seal" threadless fittings. Display measures 12⅝ by 14⅝-in.; is silk screened in two colors, and equipped with fold-out easels on back. Cross section of typical fitting is mounted in a die-cut at bottom of display. Advantages of Telsco fittings are outlined briefly, and typical uses for the fittings are shown. *Telsco Fittings Division.*

CIRCLE (105) ON THE REPLY CARD

Engineering Drawings. New brochure describes Filmsort's system for filing engineering drawings. New illustrated 16-page brochure, "The Filmsort Aperture Card for your Engineering Drawings and Allied Records," traces basic procedures in transforming an original engineering drawing to a frame of microfilm; inserting the film into an aperture card; viewing and enlarging the film from the card. New techniques such as electrostatic printing and dry-copy contact printing of the film in one card onto film in another are also detailed. *The Filmsort Company.*

CIRCLE (106) ON THE REPLY CARD

Desiccants. Complete technical data on the properties and uses of Florite Desiccant, an activated bauxite type desiccant, is given in a new 48-page, well-illustrated brochure available from the Floridin Company. Brochure discusses all of the company's products used as adsorbents, desiccants, and diluents, particularly those used in gas processing such as dehydration of natural gas. *Floridin Company.*

CIRCLE (107) ON THE REPLY CARD

Pipe Rotators. New 4-page bulletin describes pipe rotators for welding and flame cutting pipe. Described are the portable "Peck Jr.," for pipe up to 5-in. diameter that is suitable for use on construction projects, process and power installations where extensive field alternation and maintenance is a problem, and the heavy-duty model designed for pipe to 36-in. diameter that can be used for shop fabrication of welded piping. *Cecil C. Peck Company.*

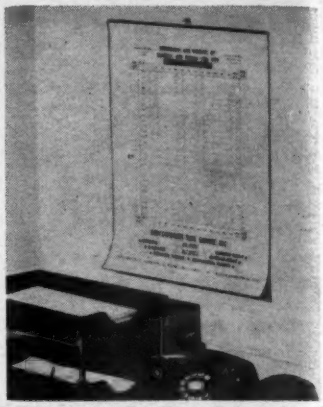
CIRCLE (108) ON THE REPLY CARD

Truck-Mounted Backhoe. Information on Ottawa's newly introduced truck-mounted backhoe for Chevrolet trucks is now available. Backhoe is designed for complete mobility as well as digging ability, and travels at regular truck speeds. Is ready to dig in seconds after arrival at jobsite. Digs 12½ ft deep in any position of 190 deg arc. Two levers control all bucket and boom actions. Automatic ejectors force all sticky material from bucket without loss of time. *Ottawa Steel Division, Young Spring & Wire Corporation.*

CIRCLE (109) ON THE REPLY CARD

Safety Equipment Housing. New catalog entitled "Moran Safety Equipment," describes the Moran Furnace and Sheet Metal Company's line of protective housings for fire fighting equipment plus a page on safety flash arresters. The 4-page catalog includes descriptive pictures, drawings, and specifications on the four main products in the Moran line: Portable fire houses, weatherproof fire extinguisher boxes, hose reel houses and safety flash arresters. Heavy gage galvanized sheet metal construction and simple installation are two of the line's more prominent features. *Moran Furnace and Sheet Metal Company.*

CIRCLE (110) ON THE REPLY CARD



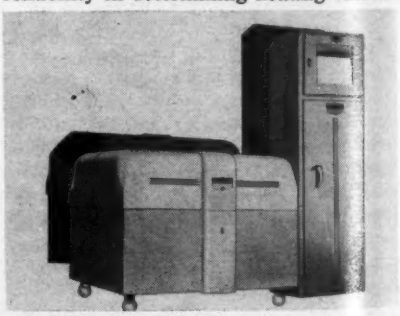
Wall Chart of ASA Pipe Schedules, Sizes, Weights. New 17 by 22-in. wall chart reproduces all essential pipe-specification information of wall thicknesses, weight, and OD of seamless and welded steel pipe under ASA schedules from ⅛ to 24-in. Large size and clear legibility of figures make chart usable on the wall as a reference. Metal ferrules stiffen top and bottom so chart will hang flat on any wall surface. *Midcontinent Tube Service, Inc.*

CIRCLE (111) ON THE REPLY CARD

American Meter Bulletins. Two new bulletins providing detailed information on American Meter's products have just been completed. Bulletin 101 contains technical data on the "Reliance Temperature Regulator," which raises distribution pressure automatically as the atmospheric temperature drops, compensating for the pressure drop caused by an increased load. Bulletin 308 describes "American Positive Meter Connections, insulated and regular," and lists connections available. *American Meter Company.*

CIRCLE (112) ON THE REPLY CARD

Calorimeter. New 6-page bulletin describes Cutler Hammer's new gas measuring equipment that is designed to provide increased accuracy and greater reliability in determining heating value in



Btu and reduce equipment maintenance to a minimum. A glass filled polyester water tank with capacity increase of 81 percent affords better insulation to reduce transfer of heat and improves stability and reliability of the measurements. Electronically operated strip chart recorder permits precise readings through use of a straight slide wire with 60 percent more turns. This allows a 10 percent wider scale and chart for greater definition and accuracy in the readings. *Cutler-Hammer, Inc.*

CIRCLE (113) ON THE REPLY CARD